GPO PRICE $ _____

CFSTI PRICE(S) $ 3.25

Hard copy (HC) _____

Microfiche (MF) 1.00

ff 653 July 65

NASA CR-62033

N66 34085

(ACCESSION NUMBER) 154 (PAGES)

(THRU) 1 (CODE)

CR 62033 (NASA CR OR TMX OR AD NUMBER)

34 (CATEGORY)

FACILITY FORM 602

GUIDE TO THE PROCESSING, STORAGE, AND RETRIEVAL OF BIBLIOGRAPHIC INFORMATION AT THE NASA SCIENTIFIC AND TECHNICAL INFORMATION FACILITY

By W. T. Brandhorst and Philip F. Eckert

June 1966

Distribution of this report is provided in the interest of information exchange. Responsibility for the contents resides in the author or organization that prepared it.

Prepared under Contract No. NASw-1315 by
DOCUMENTATION INCORPORATED
College Park, Md.

for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

For sale by the Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151 – Price $3.25

CONTENTS

			Page
INTRODUCTION			1
PART 1		PROCESSING	3
1.1		Abstract Journals	3
	1.1.1	Coverage	3
	1.1.2	Organization	3
1.2		Descriptive Cataloging	4
1.3		Abstracting	7
1.4		Indexing	8
	1.4.1	Published Indexing and Machine Indexing	8
	1.4.2	Notation of Content	9
	1.4.3	Machine Editing of Published Indexes	9
	1.4.4	Vocabulary Control and Cross-References	9
1.5		Processing Flow	10
PART 2		STORAGE (INPUT)	13
2.1		General	13
2.2		File Organization: Linear File Record and Format	16
2.3		The Data Base	17
	2.3.1	Document Processing Sheet (Facility Form 600)	17
	2.3.2	Fixed Length Data Fields (Base Data)	19
	2.3.3	Variable Length Data Fields	22
	2.3.4	Displays: Form 600 Strip and Tape Dumps	25
2.4		Linearization of 1962/63 Data	27
2.5		Coded Terms	30
2.6		Automatic Postings Control System (APC)	31
PART 3		RETRIEVAL (OUTPUT)	33
3.1		General	33
3.2		Searching: Linear File Search Worksheet (Facility Form 732)	34
	3.2.1	Limits (Non-Subject)	37
	3.2.1.1	Limit Code 10 - Document Security Classification	37
	3.2.1.2	Limit Code 11 - Accession Number Range (Positive Specification)	37
	3.2.1.3	Limit Code 12 - Accession Number Range (Negative Specification)	39
	3.2.1.4	Limit Code 13 - Accession Number Series (A, N, X, etc.)	39
	3.2.1.5	Limit Code 14 - Document Type	40
	3.2.1.6	Limit Code 15 - COSATI Subject Category	40

			Page
	3.2.1.7	Limit Code 16 - Journal Announcement Category	41
	3.2.1.8	Limit Code 17 - Corporate Source	41
	3.2.1.9	Limit Code 21 - Contract Number	42
	3.2.1.10	Limit Code 22 - Personal Author	42
	3.2.1.11	Limit Code 23 - Report Number	42
	3.2.1.12	Limit Code 25 - No Foreign Language	43
	3.2.1.13	Limit Code 31 - Sorting Options	43
	3.2.1.14	Limit Code 32 - Output Format Print Options	44
	3.2.1.15	Limit Code 33 - Hit Limit	44
3.2.2		Subject Terms (Limit Code 40)	45
3.2.3		Logical Equation (Limit Code 00-09)	46
3.2.4		Weighting of Terms (Limit Codes 29-30)	47
	3.2.4.1	Single Term Weights, With Equation (Limit Code 30)	47
	3.2.4.2	Single Term Weights, Without Equation (Limit Code 30)	48
	3.2.4.3	Group Weights (Limit Code 29)	51
	3.2.4.4	Weighting of Non-Subject Terms	53
3.2.5		Negation	53
	3.2.5.1	Negation in Logical Equation ("Not" operator)	53
	3.2.5.2	Negative Weights	54
	3.2.5.3	Negation of Non-Subject Terms	54
3.2.6		Root Searching	55
3.2.7		Comment Card (Limit Code *)	56
3.2.8		Validation of Question	56
3.3		Analysis	59
3.3.1		Pre-Search Analysis - Vocabularies	59
3.3.2		Post-Search Analysis (NASA Search System Analysis Sheet—Facility Form 637)	61
3.3.3		Edited Final Printout	63
3.4		Sample Searches	64
3.5		Sample Output Formats	92
3.6		NASA Decentralized Search Tape Program	94

Appendix

A	STAR/IAA Journal Announcement Categories: 1962, 1963-64, 1965	95
B	COSATI Subject Category List	97
C	Accession Series - Definitions	103
D	NACA/NASA Report Series Numbering Systems	104
E	NASA Contract Number Prefixes	106
F	NACA/NASA Bibliographic Reference Works	107
G	STAR/IAA Sample Pages: Introduction, Abstract Section, and Index Section	117
Glossary		142
References		148

ILLUSTRATIONS

Page

PART 1 - PROCESSING

Figure

1 STAR Citation/Abstract for Announcement, with Elements Identified. 5
2 Processing - Generalized Flow Chart 11

PART 2 - STORAGE (INPUT)

3 File Organization History 15
4 NASA Linear File Format and Schematic of Record Organization . . . 18
5 Fixed Length Data Fields (Base Data) - Form 600 19
6 Variable Length Data Fields (Front) - Form 600 24
7 Variable Length Data Fields (Back) - Form 600 25
8 Form 600 Strip - Annotated 26
9 Form 600 Strip - 1964 Data 27
10 Form 600 Strip - 1962/63 Data 28
11 Linear File - Tape Dump 29
12 Subject Terms and Their Coded Equivalents 30

PART 3 - RETRIEVAL (OUTPUT)

13 Literature Search Request Response Form (Facility Form 685) 35
14 NASA Linear File Search Worksheet (Facility Form 732) 36
15 Limit Code 10 - Document Security Classification 37
16 Limit Code 11 - Accession Number Range (Positive Specification) . . 39
17 Limit Code 12 - Accession Number Range (Negative Specification) . . 39
18 Limit Code 13 - Accession Number Series (A, N, X, etc.) 39
19 Limit Code 14 - Document Type 40
20 Limit Code 15 - COSATI Subject Category 40
21 Limit Code 16 - Journal Announcement Category 41
22 Limit Code 17 - Corporate Source 41
23 Limit Code 21 - Contract Number 42
24 Limit Code 22 - Personal Author 42
25 Limit Code 23 - Report Number 43
26 Limit Code 25 - No Foreign Language 43
27 Limit Code 31 - Sorting Options 44
28 Limit Code 32 - Output Format Print Options 44
29 Limit Code 33 - Hit Limit 45
30 Limit Code 40 - Subject Terms 46
31 Limit Code 00-09 - Logical Equation 47
32 Limit Code 30 - Single Term Weights 48
33A Search Coding Alternatives, Weight vs. Equation A + B + C + D 49
33B Weight vs. Equation A · B · C 49

Figure		Page
33C	Weight vs. Equation A + (B · C · D)	50
33D	Weight vs. Equation (A + B) + (C · D)	50
33E	Weight vs. Equation (A · B) · (C + D)	50
34	Limit Code 29 - Group Weights, No Equation	52
35	Negation in Logical Equation ("Not" Operator)	54
36	Negative Weights (Single Terms)	54
37	Negative Weights (Groups)	55
38	Limit Code * - Comment Card	56
39	Problem Validation Sheet	58
40	Sample Vocabulary Pages	60
41	NASA Search System Analysis Sheet (Facility Form 637)	62
42	Hit Card for Use as Input for Final Printouts	63
43A	PERT Project - Equation	66
43B	PERT Project - Single Term Weights	67
44A	Laser Ranging - Equation	68
44B	Laser Ranging - Group Weights	69
45A	Vacuum Ultraviolet - Equation	70
45B	Vacuum Ultraviolet - Group Weights	71
46A	Sonic Boom - Equation	72
46B	Sonic Boom - Group Weights	73
47A	Holography - Equation	74
47B	Holography - Group Weights	75
48A	Laser Communications - Equation	76
48B	Laser Communications - Group Weights	77
49A	Thrust Vector Control - Equation	78
49B	Thrust Vector Control - Group Weights	79
50	Radiation Effects - Negative Weights	80
51	Selected Accession Ranges	81
52	COSATI Categories	82
53	Weightlessness - Group Weights	83
54	Corporate Source	84
55	Contract Numbers	85
56	Contract Number Root	86
57	Personal Author	87
58	Multiple Authors	88
59	Combined Search - Group Weights	89
60	Report Number Root	90
61	Nuclear Propulsion - Document Type	91
62	Sample Output - Accession Number	92
63	Sample Output - Accession Number and Citation	92
64	Sample Output - Accession Number and Terms	92
65	Sample Output - Accession Number, Citation, and Terms	93
66	Sample Output - Accession Number, Citation, NOC, Terms, and Weight	93

TABLES

Table		Page
1	Elements of Citation	5
2	Fixed Length Data Fields - Definitions	19
3	Variable Length Data Fields - Definitions	23
4	Search Capability Comparison for 1401 and 1410 Systems	38
5	Document Type Code (Source/Availability)	40
6	Validation Listing: Error Codes and Their Meanings	56

ABSTRACT

Document processing techniques utilized by the NASA Scientific and Technical Information Facility are described in general terms. Computerized information storage and retrieval techniques are described in detail. The current basic file organization is that of a linear file. File size, after the first 4 years of Facility operation (1962-65), is nearly a quarter of a million items, and is growing at a rate of approximately 75,000 a year. Storage is on magnetic tapes and the system makes use of an IBM 1410 computer system for data manipulation and retrieval. Retrieval techniques are varied and utilize Boolean Logic (with negation), weighting of terms (featuring a grouping technique permitting the simulation of Boolean Logic), searching of "roots" (leading strings of characters), and the ability to intermix descriptive cataloging elements with subject index terms.

The report is designed primarily as an instruction manual for analysts, librarians, and information specialists whose organizations are within NASA's decentralized tape user program. The historical perspective which is provided on the development of the program makes the report suggestive for organizations planning to implement mechanized documentation systems.

Several appendixes permit the report to function also as a reference tool in the general area of NACA-NASA publications.

SUGGESTED INDEXING FOR THIS PUBLICATION

Major Index Terms	Minor Index Terms	
DATA PROCESSING	BIBLIOGRAPHY	PUBLICATION
HANDBOOK	COMPUTER	PROCESSING
INFORMATION PROCESSING	DATA	PROGRAM
INFORMATION RETRIEVAL	DOCUMENTATION	RETRIEVAL
	INFORMATION	SEARCH
	LITERATURE	TECHNICAL

INTRODUCTION

The National Aeronautics and Space Act of 1958 established, as one of the functions of the National Aeronautics and Space Administration, the responsibility for providing "the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

To better fulfill this mandate in a world undergoing an "information explosion," NASA undertook, in 1962, a program to provide comprehensive bibliographic services covering the world's aerospace literature.

These services are provided primarily through the efforts of two organizations: (1) The NASA Scientific and Technical Information Facility, which has been operated on contract since 1962 by Documentation Incorporated under the direction of NASA's Scientific and Technical Information Division, and (2) The American Institute of Aeronautics and Astronautics (AIAA), whose Technical Information Service has been partially supported by NASA since 1963.

These organizations prepare semimonthly abstract journals as a means of achieving rapid announcement and dissemination of research and development results. These are, respectively, Scientific and Technical Aerospace Reports (STAR), and International Aerospace Abstracts (IAA). These journals are complementary to one another and do not overlap in their coverage.

Each organization has a full range of the supporting machinery necessary for such journals, e.g., acquisitions, subscriptions, and exchange arrangements; cataloging, indexing, and abstracting facilities; photocomposition (Facility only) and microfiching capabilities; and each organization is prepared to service requests for the materials it announces (See Appendix G).

The NASA Facility also prepares a wide variety of bibliographic reference works in addition to STAR. All such NASA published or sponsored bibliographic tools are described in detail in Appendix F.

The bibliographic information which results from the document processing activities of the two organizations is stored at the NASA Facility and constitutes a comprehensive, continuously updated, and readily accessible data base for the performance of Selective Dissemination of Information programs, cumulative journal indexes, and the retrospective searching function.

Data processing, storage, and retrieval at the NASA Facility are computerized operations currently oriented around magnetic tapes. Following a policy of decentralization, NASA has made the data base available on tapes to a number of recipients, together with the necessary computer programs, to enable them to independently search and manipulate the data.

This report is based on various guides and preliminary documents prepared for the benefit of librarians and information scientists who utilize these decentralized services, as well as for the staff of the Facility who produce them.

The emphasis is, as the title indicates, on the bibliographic processing, storage (input), and retrieval (output) of the data, and no attempt has been made to prepare a report on all phases of Facility operations. The description of the processing activity is in more general terms than that dealing with machine storage and retrieval, insofar as bibliographic processing activities, wherever they occur, are basically much alike. Storage and retrieval operations are presented in more detail. Areas of Facility activity which are, for example, not covered here are: Acquisitions, Document Storage, Document Request Processing, Document Reproduction, Photocomposition, Journal Preparation, Selective Dissemination of Information, and Microfiche Production and Distribution. This report is likewise not intended to be a formal description of the computer programs involved. These are referred to strictly in terms of the capabilities they provide, without the technical programming details available in the respective run books or operating instructions.

It is hoped that this report will provide information relating to the NASA Facility's work, in the areas defined, to those engaged in aerospace information activities and to the documentation profession as a whole. The appendixes have been especially designed so that the report may also function as a reference tool in the area of NASA publications in general.

PART 1. PROCESSING

1.1 ABSTRACT JOURNALS

In early 1962, the Scientific and Technical Information Facility began to prepare, for NASA's publication, an abstract journal entitled Technical Publications Announcements (TPA), Volume 2. This continued an earlier, sequentially numbered, NASA publication of the same name which had reached Issue 70 by the time of the changeover, in April 1962. Issues 1-70 of TPA were, therefore, understood to be Volume 1, though they do not themselves bear this designation. TPA, Volume 2 was considerably more comprehensive than Volume 1 had been.

Beginning with 1963, TPA was continued under the new name Scientific and Technical Aerospace Reports (STAR). Full bibliographic information on this journal, its predecessors, and its classified counterparts, can be found in Appendix F.

1.1.1 Coverage

In general, the coverage of Scientific and Technical Aerospace Reports can be described as the report literature. Complementary coverage of journal articles, books, and other formally published materials—the so-called open literature—is provided by International Aerospace Abstracts. The two journals together attempt to provide comprehensive access to the world's current literature dealing with aerospace science and technology. By special arrangement, STAR and IAA are issued in coordination with each other and on alternate weeks. Both use identical subject categories to group their announcements, and both contain basically the same indexes.

1.1.2 Organization

Each journal consists of three sections:

(a) Front Matter: Introductory material describing the journal, its coverage, its availability, and the availability of documents announced therein. A Table of Contents listing (1) the subject categories (and their scope notes) by which citations are arranged for ease and scanning and the page number on which each category begins (2) the indexes available in the issue and the page number on which each index begins.

(b) A Textual section containing the abstracts and descriptive citation information for given accessions. The textual sections are paginated continuously for the entire year to simplify volume binding.

(c) An Index section providing all standard access points to the items announced. STAR contains a full complement of indexes: (1) Subject, (2) Corporate Author or Source, (3) Personal Author, (4) Contract Number (in cumulative indexes only), (5) Report/Accession Number, and (6) Accession/Report Number. IAA, dealing with a different type of material, finds the Corporate Author and Contract Number indexes unnecessary and restricts itself to a straight Accession Number index rather than Accession/Report. The index sections are individually paginated for each journal issue.

The current 34 announcement categories were developed after extensive analysis of the subject matter of documents and consultation with scientists and librarians. They are not intended to represent a formal classification scheme; rather, their purpose is to divide a large and multi-disciplinary subject area into roughly commensurate units for the convenience of the reader. Each category is defined and related to the other categories by its scope notes. The announcement categories have changed twice since 1962 (See Appendix A) and the possibility of further change always exists, as they remain responsive to the needs of the users.

The accession or control number associated with each item announced consists of an identifying prefix (N for STAR, A for IAA, X for Classified STAR), the last two digits of the year of announcement, and a sequential five-digit accession number. Items in the journal are arranged by accession number within each announcement category. During 1962-1965 each accession number in an index was associated with both the journal issue and category numbers for finding purposes. For example, the designation "N65-12345 03-06" identifies the 2345th document accessioned for STAR in 1965, the abstract for which appeared in subject category 06 of issue 03 of that year.

In 1966 this system was changed so that the designation within an individual issue was simply category, e.g., "c04 N66-12345," with the particular issue number dropped as unnecessary.

As an added convenience to users, the annual cumulative index for 1965 refers to issue and page number, e.g., "N65-12345 03 383," rather than to issue and category. Subsequent cumulative indexes will also carry the issue and page designations, but arranged as follows: "02 p0342 N66-12345."

The user, lacking the issue or category identification for a document, will find that the cover and spine of each STAR issue prominently display the span of accession numbers contained therein, and that a sequentially ordered list of all accessions appears as the Accession/Report Number Index. Any abstract may be located quickly, therefore, when the accession number is known.

Sample pages of STAR and IAA introductions, abstract sections, and index sections appear as Appendix G.

1.2 DESCRIPTIVE CATALOGING

The basic principle observed in descriptive cataloging at the Facility is to catalog from the document. In general, time is not expended in verifying the form of cataloging elements, such as author's names, contract numbers, report numbers, etc., that appear on the document, against an authority (except where interagency standards apply, e.g., corporate source forms).

The format of the citation, as it appears in STAR, is shown in Fig. 1 and the elements of the citation are described in Table 1.

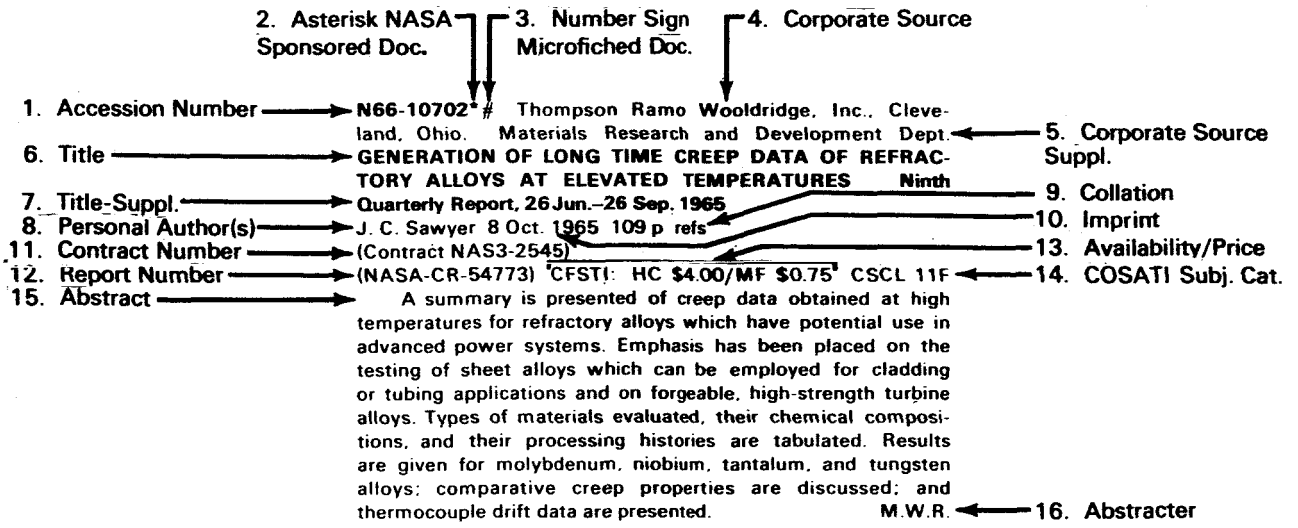


Fig. 1: STAR Citation/Abstract for Announcement, with Elements Identified

Table 1. Elements of Citation

1. Accession Number - This element has already been described in Section 1.1.2, in connection with its role in the organization of the abstract journals and their indexes. Definitions of most of the accession number series can be found in Appendix C, together with information as to the kinds of processing (cataloging, indexing, abstracting) they receive, whether they are on microfiche, and whether they are available from the Facility.

2. NASA Support Asterisk (*) - Support may be direct, as with a NASA formal report, or contractual, a grant, an intergovernmental transfer of funds, etc.

3. Microfiche Pound or Number Sign (#) - Appears if the document has been placed on microfiche. In the case of documents whose parts have been independently analyzed, this sign appears for the parent document but not for the parts (q.v., "Analytic" in Glossary).

4. Corporate Author or Source - Name forms chosen from COSATI authority list or constructed in accordance with the COSATI rules (in draft form at this writing).

5. Corporate Source Supplementary - An organizational subdivision of the main Corporate Source.

6. Title - The substantive portion of the title describing the scientific/technical content of the document.

7. Title-Supplementary - All phrases indicative of the administrative nature of the report (e.g., Monthly Technical Progress Report No. 5), the period covered, the body reported to, and so on, are considered "title-supplementary"

Table 1 (Con't.)

and follow the title proper in bold face with initial capitals. Foreign language titles appear in brackets immediately following the English translation of the title.

8. Personal Authors - A limit of five appear in the published citation, with "et al" if necessary. If more than five authors are mentioned in a NASA-supported document, only the first five are cited in the descriptive cataloging, but all are indexed. If more than five authors are mentioned in non-NASA documents, only the first five are cited and indexed; the remainder are dropped. Certain categories of individuals, such as "approvers," "contributors," "monitors," etc., are screened out. The citation contains the form of the name as given on the document; the indexing, however, is limited to surnames and initials. If the corporate affiliation of the author differs from the corporate source, the affiliation is given in brief form in parentheses directly after the author's name. It is not indexed. Thesis notes also appear in parentheses after the author's name.

9. Collation - The combination of pagination, notes referring to any special quality of the document (loose-leaf, map, etc.) and the existence of references.

10. Imprint - Includes place of publication, publisher, and date. In report literature, the first two are usually the same as the Corporate Author and therefore the date alone may be given at this point. Whenever available, the date is given, including month and day.

11. Contract Number - All contract or subcontract numbers that supported research reported in the document are shown. Contract numbers are preferred to statements indicating financial support, but support is indicated if it stands alone. Contract numbers are generally prefixed with standard abbreviations indicating their source, e.g., AF, DA, AT, NAS, etc. If the prefix is not sufficiently informative, an additional attributory phrase may be provided. Project names or numbers are given only in the case of NASA-supported work. (See Appendix E for NASA contract number prefixes.)

12. Report Number - Report numbers of both the contractor and the monitoring or sponsoring body are cited. They are generally in that order with the exception that NASA report numbers are always given first. Accession numbers of large report processing organizations, such as DDC's AD-series, are treated as report numbers.

13. Availability/Price - Whenever a document contains a statement of availability or price, this is given, as briefly as possible, in the citation. Several common abbreviations are used: CFSTI for the Clearinghouse for Federal Scientific and Technical Information (formerly the Office of Technical Services (OTS)); GPO for the U. S. Government Printing Office, etc. Unclassified reports carrying no distribution limitations, that have been prepared with NASA support, are automatically made available to CFSTI for the benefit of the general public, and appear in STAR with a Hard

Table 1 (Con't.)

Copy (HC) and MF (Microfiche) price. Department of Defense documents are not processed by the Facility until an AD number has been obtained from the Defense Documentation Center (DDC) (Formerly the Armed Services Technical Information Agency (ASTIA)). The presence of an AD number automatically indicates availability from DDC for those organizations registered with it.

14. COSATI Subject Category - Beginning with 1965 STAR 15, all NASA supported documents processed by the Facility are assigned to one of the standard subject categories developed by the Committee on Scientific and Technical Information (COSATI), and listed in Reference 13 (also see Appendix B).

15. & 16. Abstract and Abstracter - see Section 1.3.

1.3 ABSTRACTING

Abstracts appearing in STAR, CSTAR, and the other Facility-prepared publications, may have any of four possible sources: (1) the document may have come equipped with abstract, in which case it is attributed to "author;" (2) the abstracting staff of the Facility may have written it from a study of the text, in which case the abstracter's initials appear at the end; (3) the document may have been abstracted in DDC's Technical Abstract Bulletin, in which case it is attributed to "TAB;" (4) the document may have been abstracted in AEC's Nuclear Science Abstracts, in which case it is attributed to "NSA."

Author-prepared abstracts are used whenever possible, but they must meet Facility criteria. In addition, they receive a general edit for matters of spelling, punctuation, grammar, length, and typography. As long as the author's viewpoint is preserved, such abstracts will carry the attribution "author."

TAB and NSA abstracts are used verbatim, without change or modification other than perhaps that connected with a figure, equation, or formula presenting photocomposition problems.

Whenever possible, abstracts are kept to a length of 150 words. Contents Notes may be used in lieu of abstracts for works containing chapters or papers on a variety of subjects. Conference proceedings or contributions will generally be handled via Contents Notes.

An effort is made to prepare abstracts of the informative type rather than the merely descriptive or indicative variety. Scientists and engineers in the aerospace disciplines comprise a large and heterogeneous group. For this reason, it is considered important not only to spare reading time by providing adequate technical information in the abstract, but also to fully bring out the author's conclusions, viewpoints, the aim of the research, the methodology, and positive and negative results.

Abstracters are instructed to ask themselves the following questions: (1) What was done? (2) Why was it done? (3) By what means was it done? (4) What were the results? (5) What do the results mean?

Abstracters are further instructed to observe the following basic principles: use short, normal sentences but avoid abbreviated English; use standard terms and avoid unnecessary contractions; use the third person; avoid mixed tenses and the combination of indicative and imperative forms; do not amplify statements by examples; avoid comparisons with the work of others or with common knowledge (this does not imply excluding reference to the work of others, if the present work is based on it); avoid unnecessary words or phrases; and be sure that the conclusions and results selected in the abstract agree with the main purpose of the work.

1.4 INDEXING

Indexing and abstracting are part of one operation at the Facility and are performed by the same employee. The abstracter/indexer orients himself to the scope and purpose of the document by reading its title, table of contents, introduction, and summary or conclusions, finally proceeding to the body of the text itself. As he reads, he records on the document processing sheet the subject terms descriptive of the document's contents. These terms are of two types owing to the two basic uses to which they are put: (1) published journal indexes, and (2) computerized literature searches.

1.4.1 Published Indexing and Machine Indexing

The journal indexes are "non-manipulative;" therefore, the terms appearing therein must be by themselves meaningful to the user. For this reason, they tend to be composite terms, phrases, bound or "pre-coordinated" terms rather than single words or "Uniterms" (e.g., "Infrared Radiation" rather than "Radiation" alone). The indexer explicitly identifies the "published terms" he has selected for journal use. Three such terms, on the average, are developed for each document. They represent the major concepts of the document.

The indexer also develops a body of indexing terms which probe the content of the document in depth. These are called "machine terms" because they do not appear in the journal index but only on the basic file used for computer searching. The computer file being eminently "manipulative," these terms tend to be single words, unbound terms, or "Uniterms," in the classic style of coordinate indexing. Machine terms should include the individual words that make up the composite published terms. Eleven such terms, on the average, are developed for each document. They represent both the major and minor concepts of the document, reduced to their constituent parts.

Both published and machine terms are part of the computer record and are individually identified. In this sense, published terms are also machine terms; both can be searched by machine. It is possible to restrict a search, or part of a search, to published terms alone.

Due to fluctuations in indexing policy and practice over the years, it is important to realize that the entire file does not illustrate consistent application of the principles described above. Published terms sometimes appear without their machine term breakdown (machine terms, of course, appear without any synthesis into more specific

published terms). Any search of the entire file must take this into account and make use of the terms involved in both their forms if it is to be complete. The sample searches in Section 3.4 in general illustrate this requirement; see, for example, in the search on weightlessness the use of both the published term "Zero Gravity" and the coordination of its component terms "Zero" and "Gravity."

1.4.2 Notation of Content

The Notation of Content or "NOC" is a device that was conceived to compensate for the frequent inadequacy of titles. It is an "improved" title, a condensed narrative statement headlining terms of substance and eliminating common words. It attempts to include all subject terms used as published index access points. It thus shows each index term in context and is used in the indexes as a sub-entry discriminator, sparing the user from having to locate the item in the text in order to tell what it is about. In STAR and IAA indexes, a Notation of Content for a given document appears under all of the published terms assigned to that document. (See Appendix G.)

1.4.3 Machine Editing of Published Indexes

Until mid-1965, cumulative indexes to STAR were edited (as well as prepared) by a computer program that manipulated entries on a statistical basis. This application of a statistical criterion—the frequency of postings of individual indexing terms—for the compilation of subject indexes, took advantage of certain formal and invariable relationships which were established among terms in the indexing vocabulary. A complete description of the system can be found in Reference 7.

The technique is no longer applied, primarily because of new constraints which each candidate for the vocabulary must pass before being admitted. However, since over three years of cumulative indexes were prepared utilizing the system, no description of Facility indexing practices would be complete without some mention of it. Briefly, the following editorial rules were employed by the computer:

(a) Delete from the subject index all specific composite terms and transfer their postings to their higher generic ("formally" related) terms, except (1) when the specific term contains more than five postings, (2) when the specific term contains the proper name of a person or an identifiable name for a project, system, equation, etc., (3) when the higher posting contains more than 50 postings, and, (4) when the higher generic concept does not exist as such, or when it has been determined to be not a postable term;

(b) Generate see also cross references from higher generic terms to formally related specific terms that were not deleted for any of the reasons (1) through (4) above; at the same time, delete from such generic terms all items also listed under the pertinent specific terms;

(c) Create a see cross reference from higher generic terms to their formally related specific terms whenever the generic term is not a posted term.

1.4.4 Vocabulary Control and Cross-References

The vocabulary used for subject indexing (both machine and published terms), and the cross-references used in STAR cumulative indexes, are directly monitored by the

Information Services Branch of NASA's Scientific and Technical Information Division (STID).

A new term is requested when the indexer finds a term which is not contained in the existing vocabulary and which is needed to adequately describe the document. While the new term is undergoing editorial review by NASA, the document is posted to the nearest equivalent term or to a higher generic term. The cycle of control, from indexer to editor to NASA, does not permit approved terms to appear in the individual STAR issue first requiring them. After approval, the document is posted to the new term for the benefit of cumulative indexes and retrospective literature searches.

Cross-references are selected by the vocabulary editor and are likewise forwarded to NASA. Following approval, the references are added to the master cross-reference file for use in cumulative indexes.

Candidate terms and cross-references are generated by the American Institute of Aeronautics and Astronautics (AIAA), the Aerospace Medical Division of the Library of Congress (which contributes to Aerospace Medicine), and the NASA Facility.

Sample pages from each of the Vocabulary Authorities can be seen as Fig. 40.

1.5 PROCESSING FLOW

The common cataloging elements described in Section 1.2 above, along with a variety of additional data required for administrative, statistical, or security purposes, are entered during screening and processing on a single Document Processing Sheet known as Facility Form 600 (Figs. 5-7). (The preprocessing or screening stage, where this form is initiated, will not be dealt with in any detail. It encompasses primarily the duplicate check operation, the administrative controls required to obtain a sign-off by the contract monitor or an AD Number, the technical evaluation of the document as being in subject scope, and the assignment of the document to a given accession series and consequent type of processing).

The indexing terms and abstract are likewise entered on this form. The disposition of the Form 600 for photocomposition and keypunch purposes is shown in Fig. 2, which presents a generalized picture of the entire processing flow, including screening and photocomposition/journal make-up. At the present time, all data except the abstract are keypunched for input to magnetic tape storage. Selected data and the abstract are punched on paper tape for input to the photocomposition equipment. Journal indexes are prepared by computer manipulation of the indexing data on the tapes. Through 1965, this was done on an IBM-1410/1401 computer configuration. Beginning with 1966, however, and as one facet of increasing intragovernmental cooperation, these indexes are prepared on the National Library of Medicine's GRACE, a computer-driven photocomposition system.

Additional details on the data captured by the Document Processing Sheet are covered in the next section, Part 2—Storage, in connection with their position in the actual machine record.

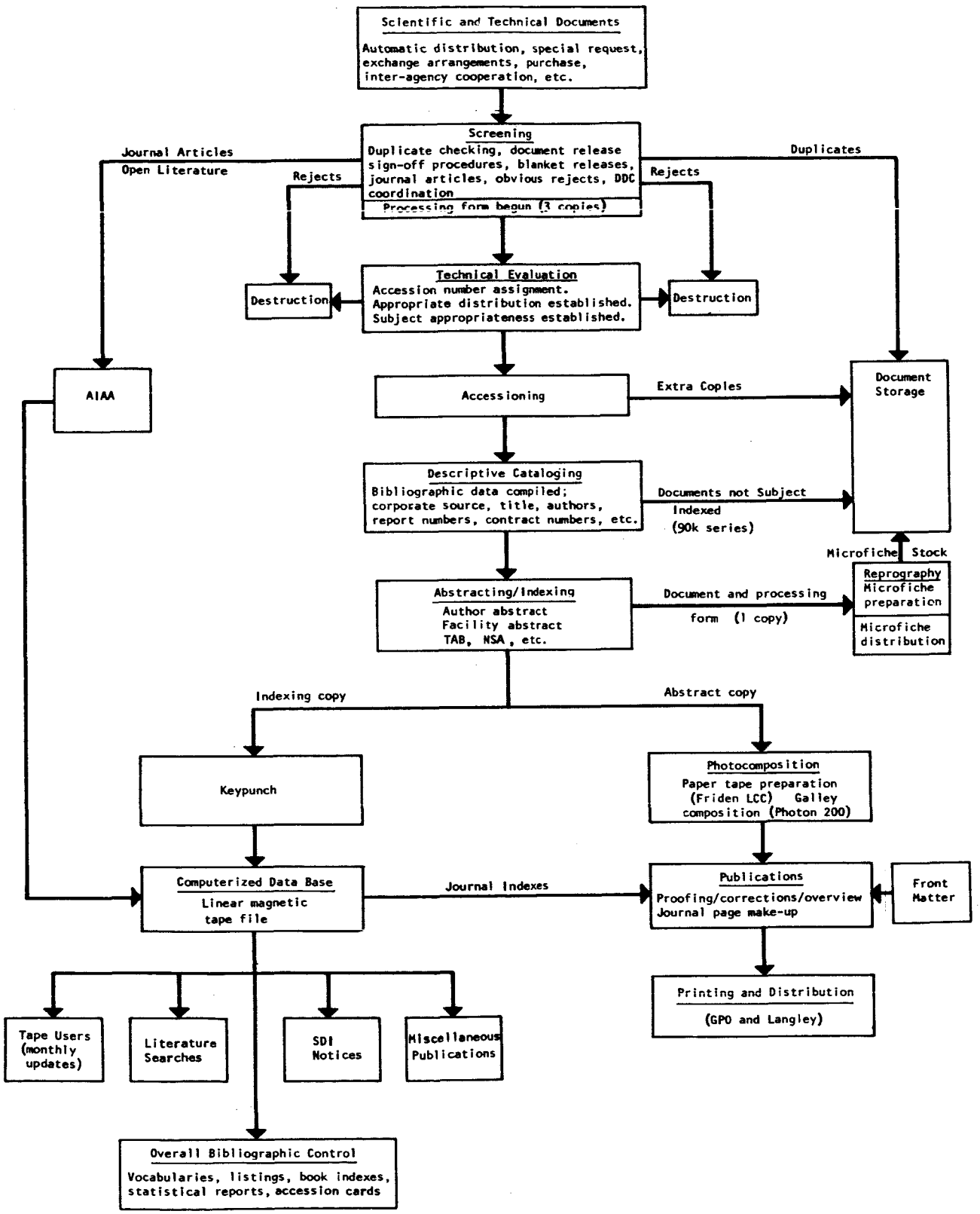


Fig. 2: Processing—Generalized Flow Chart

PART 2. STORAGE (INPUT)

2.1 GENERAL

During the four-year period January 1962-December 1965, the NASA collection of bibliographic citations on magnetic tape grew to nearly a quarter million items. The majority of the stored citations represent documents which have been announced in various of the NASA or NASA-supported abstract journals. About 15% of the stored citations represent documents that have not received current announcement, either because of their age, lack of sufficient technical content, preliminary nature, or other reason. Definitions for most accessioning series may be found in Appendix C.

The initial file organization of the NASA system was that of an "inverted file." Accession numbers were stored under each of the subject terms or bibliographic index points by which retrieval was desired. Searches were performed on these inverted files, utilizing an IBM-1401. The accession number output was then matched against a linear file of straight citations (without indexing detail), if citation output was desired. The system is described in the Guide for that period (Reference 2) and is now obsolete.

By mid-1963, however, operating experience with the inverted file and the IBM-1401 computer configuration had revealed several shortcomings. Systems studies initiated at this time indicated that a shift to a "linear file" organization would result in greater efficiency in both the computer preparation of journal indexes and in the file maintenance and update function. In addition, a linear system, with all data for a given accession placed at a single tape location and adequately tagged, would provide a considerably more flexible search system. Search demands on the inverted file had significantly exceeded capabilities. It was clear that it would be necessary not only to provide for the routine searching by such elements as year groups, accession number ranges, announcement categories, document types, security classification, report number and contract number roots, etc., but that the system would have to be flexible enough to permit searching on almost any formally isolatable bit of data, should the demand arise. Only a linear file could meet such requirements. Approval for the change to a linear file organization, utilizing an IBM-1410, was received in December 1963 and detailed design work and programming (including provision for conversion of inverted data) commenced in earnest in January 1964. The rationale for the changeover is more fully documented in References 3, 9, 10.

The basic organization of the Linear File is quite straightforward. All administrative, bibliographic, and indexing data for the first accession, N62-10001, appear at the beginning of the first Master File Tape. Data for N62-10002, N62-10003, etc., follow in order. The tapes are blocked into records having a maximum possible size of 3,000 characters (Fig. 4). No accession record has ever exceeded this size. The accessions on tape through 1965 filled approximately twelve reels in this fashion. The overall sequence observes first year and then alpha-numeric ordering, as follows:

N62-10K, 60K, 70K, 80K; X62-10K, 60K, 70K; A63-10K; N63-10K, 80K, 90K; X63-10K, 50K, 80K, 90K; A64-10K, 80K; N64-10K, 80K, 90K; X64-10K, 50K, 80K, 90K; A65-10K, 80K; N65-10K, 80K, 90K; X65-10K, 50K, 80K, 90K

New series may be inserted on the tapes at any time and would be placed in accordance with the year/alpha-numeric sequencing rules. Any given series may, of course,

be stripped and removed from the tapes as desired. In connection with the decentralized search tape program, this is done routinely depending on the user, his interests, and his capabilities to receive, from an administrative and security viewpoint. (See Section 3.6 for details on this program.)

The IBM-1410 Linear File Search System became fully operational at the Facility in December of 1964 and 14 users received field implementation in February of 1965. Conversion of the file from its former inverted organization to the necessary linear format was not fully completed until January 1965 (See Section 3.1). The Linear Search System markedly improved bibliography production capabilities and the availability of compilations of file data of all sorts.

The desire to make the Linear Search System available to a community of potential users having a variety of computer configurations led to a plan for the development of computer programs for the most well-represented of these configurations. The programs were to be roughly equivalent to the Facility's basic IBM-1410 program. The limitations of some hardware would, of course, involve some loss in capability or flexibility, just as the superiority of other hardware might make possible additional features and improved speed.

The Linear Search Programs for the IBM-1401, which were made available in July 1965, represent the first fruit of this plan produced by the Facility. The next phase will involve the IBM System/360 which will replace the Facility's present computer sometime late in 1966. Further products are still in the discussion stage.

Other organizations, interested in making use of the NASA tapes, have already moved parallel to this plan, producing their own programs to manipulate the tape data according to the needs of their own particular operating environment. Most of these operations involve severely re-formatting the NASA file with considerable loss of the non-subject data the Facility finds necessary. They make no attempt to be the equivalent of the Facility's present 1410 system, being contributions to the art in their own right.

Three of these efforts, each involving IBM-7090 series equipment, at the University of Pittsburgh, Republic Aviation, and North American Aviation, are described in References 12, 17, 20-22. Additional activity, involving a CDC computer, is currently going on at the University of Indiana.

The Facility's IBM-1401 system has neither the capacity nor the flexibility of its IBM-1410 system, largely because of the disparity in memory size and access time between the two systems (1410-40K versus 1401-8K, 12K, or 16K). Reference 18 constitutes the Guide to the 1401 linear system. However, an important element of file structure was added with the 1401 system and has been perpetuated in improvements to the 1410 system described herein. This element is the development of "Coded Terms," standard five-character codes for the otherwise variable length subject terms, to increase the speed with which terms could be scanned. This concept is described in Section 2.5.

The 1410 Search System with the "Coded Term" improvement, additional search strategies such as the "Hit Limit," "No Foreign Language Limit," negative and group weights (Section 3.2.1), and a new internal program process for comparing search terms with indexing data, has come to be referred to as Model II of the 1410 Search System. Model II is scheduled to be made available to the field early in 1966. Fig. 3 attempts to give some idea of this evolutionary process in the Search Systems.

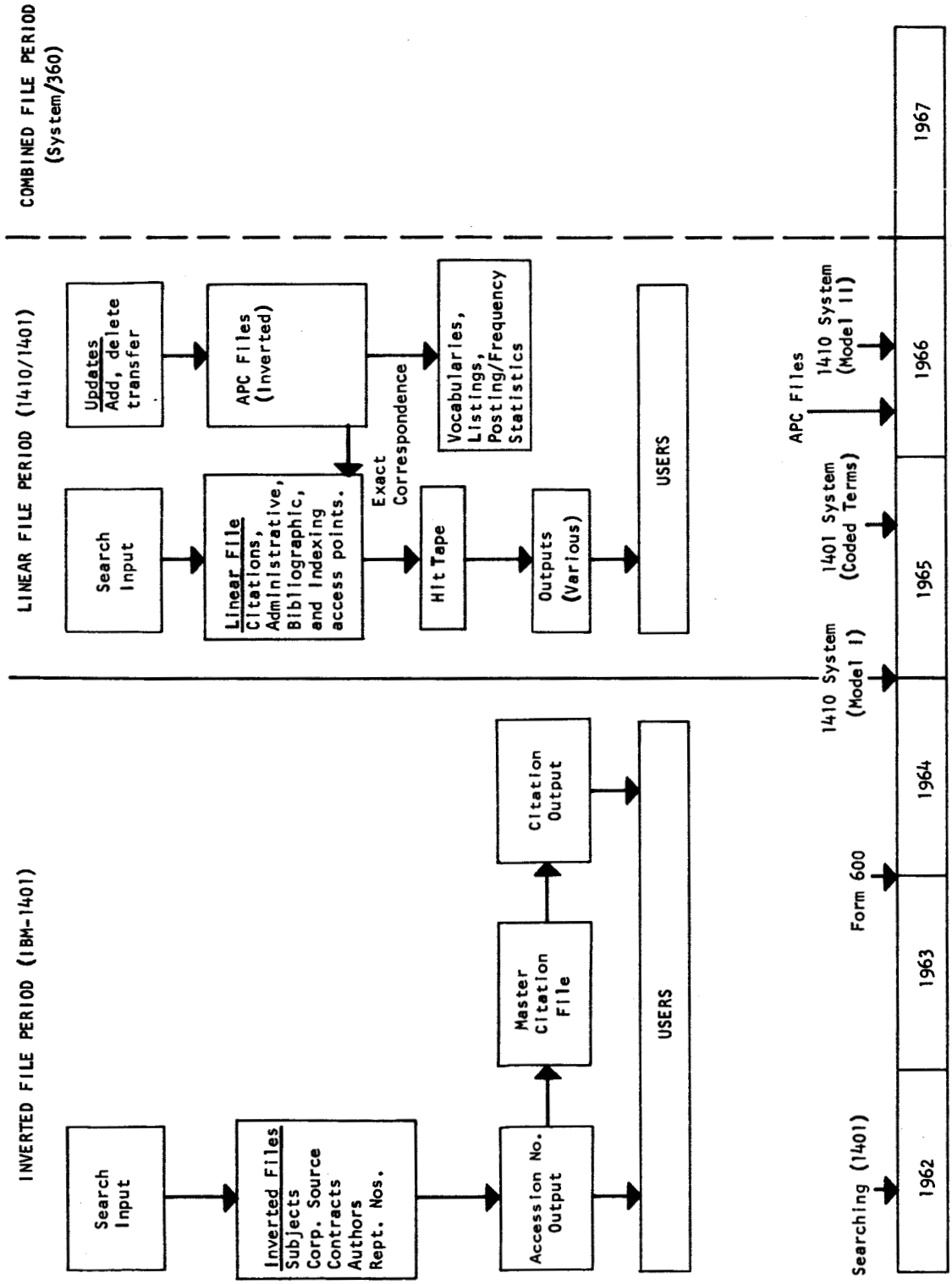


Fig. 3: File Organization History

Part 2—Storage: File Organization

Model I of the 1410 Search System is described in Reference 11. The present report attempts to be a Guide solely to Model II.

Closely related to the implementation of the Model II Search System, but not a part of it, is a second element of file structure which has come to be known as the Automatic Postings Control System (APC). This is an internal technique developed to assist in Facility updating of the main linear file and in the preparation of vocabularies, listings, and reports relating to terms/postings, usage and frequency, etc. APC constitutes, in effect, a return to inverted files for certain special purposes. It is described in more detail in Section 2.6.

2.2 FILE ORGANIZATION: LINEAR FILE RECORD AND FORMAT

The Linear File record is a variable length form 4 tape record written in the load mode with a maximum block size of 3,000 characters. Each record consists of three major parts:

1. A fixed length data field area for the so-called "base data" for a given accession. This includes such items as accession number, document and title classification, announcement category, language of text, document type, etc. There are 35 distinct elements in the base data, including a record length field for computer system control. Every accession has a base record but not all codes need be present. A total of 80 characters is allotted to this coded information.

2. A relative image area which pinpoints the location, if present, of the fields in the third or variable portion of the record (their location relative to a base point in the fixed area of the record). This base point is Position 81. The relative image technique permits great economies in tape passing time. A total of 44 characters is allotted to this area.

3. A variable length data field area which contains information of variable format and length, referenced by the relative image fields. This area contains most of the conventional descriptive cataloging details—corporate source, title, author, report number, contract number, etc. It also contains the indexing terms (and their coded equivalents) assigned to the given document. The data for preparation of journal indexes and for accession cards come for the most part from the variable length fields. The searching activity draws on both the fixed and variable data fields. Each of the ten possible variable length fields is separated from the other fields by a dollar sign ($). There are actually three types of variable fields, which we may call "text," "terms," and "coded terms." The "text" field consists of title, notation of content (NOC), and descriptive and historical note fields for miscellaneous cataloging data. These "text" lines are variable in length up to 46 characters per line. There is theoretically no limit to the number of lines each field may have up to the total maximum size of the record itself which is 3,000 characters. The "term" fields consist of such types of data as author, corporate source, report number, contract number, and subject terms, which are more limited and standardized in size, as well as more numerous. The "coded term" field consists of five character codes which correspond to vocabulary terms on a one-to-one basis. These codes represent a major improvement over the 1410 Model I system and are, in fact, a design concept calculated to achieve greater search speeds. They are described in more detail in

Section 2.5. Because of difficulties in searching variable length data fields, it is advantageous to use fixed length data segments. Both the "term" and "coded term" fields are of fixed length segments based on the average length of each type of data: corporate source, 52 characters; personal authors, report and contract numbers, 15 characters each; subject terms, 11 characters; coded terms, 6 characters. Multiple segments can be used for a single term, if required, except for coded terms which never vary in size and therefore are limited to one segment each. The relative image references the low-order position of the first segment of each searchable field (personal author through coded term), to speed the search process.

The format of an individual Linear File record and a schematic of the relationship among individual records are shown graphically in Fig. 4. The individual accession records are preceded by a record mark. Major 3,000 character record blocks are separated by an "Inter-Record Gap (IRG)" of 3/4 inch to allow for tape drive speed-up and slow-down. Blocks are preceded by a "Block Character Count."

Input to the "text" and "term" fields of the Linear File record is effected via the Document Processing Sheet (Facility Form 600). Input to the "coded term" fields is effected by the computer itself via a special computer program designed to produce a "random" code for each term with little chance of code duplication. Detailed descriptions of the various data elements contained on the Form 600 may be found in Paragraph 2.3.

2.3 THE DATA BASE

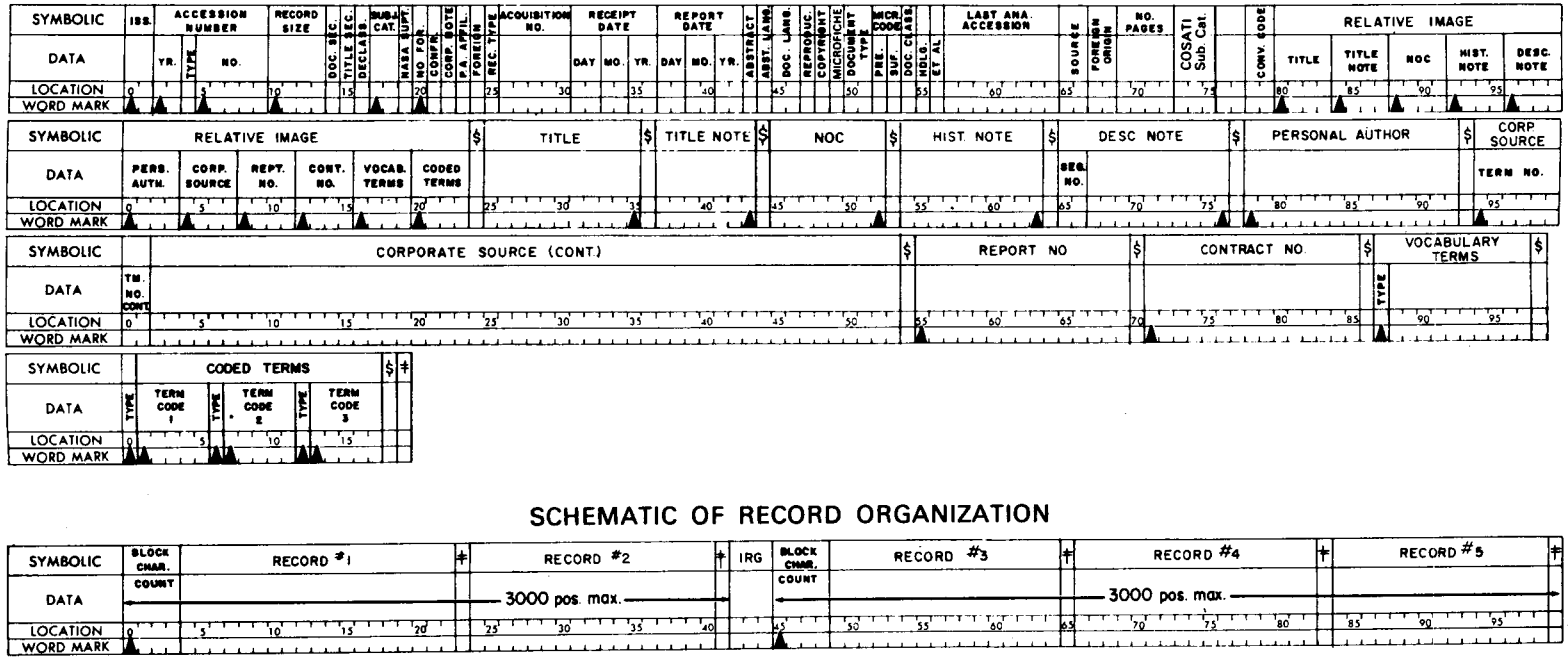
2.3.1 Document Processing Sheet (Facility Form 600)

The Document Processing Sheet is the vehicle for input to the Linear File tape record. From the moment that processing of a document begins, it is recorded on a Form 600. The mailroom, the duplicate searchers, the technical evaluator, the descriptive catalogers, the indexers, the abstracters, all have their appropriate portions of the form to complete. When processing is complete, one copy of the form goes to photocomposition (a Photon 200, soon to be replaced by a 713) for preparation of the journal text, one copy goes to Keypunch for punched card input to the tapes, and one copy stays with the Case File of the document. Plans are underway to combine the present two keyboardings the data receives into one keyboarding that will capture the data for all purposes. At that time the abstract may become part of the magnetic tape store. As explained in Section 1.5, however,the abstract is at present the only data not input to the magnetic tape.

Since the fields on this form correspond almost exactly to the Linear File data fields, the remainder of this section will be devoted to a detailed description of the Form 600. See Figs. 5, 6, and 7, and Tables 2 and 3.

NASA LINEAR FILE-1410 MODEL II

September 1, 1965



SCHEMATIC OF RECORD ORGANIZATION

Fig. 4: NASA Linear File Format and Schematic of Record Organization

Part 2—Storage: The Data Base

2.3.2 Fixed Length Data Fields (Base Data)

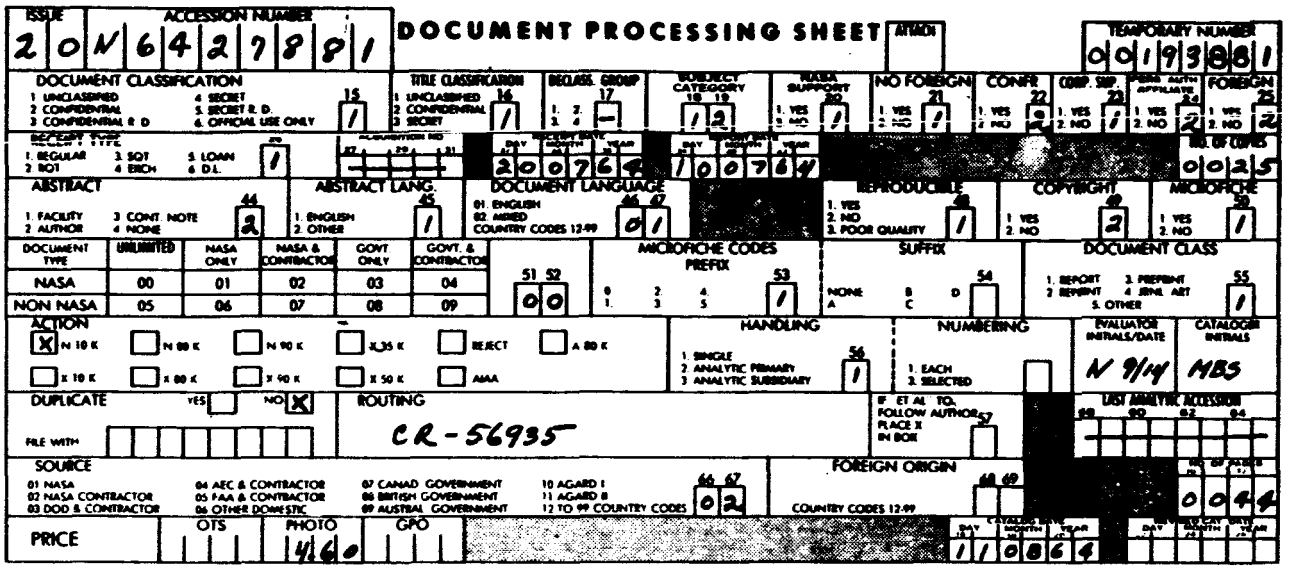


Fig. 5: Fixed Length Data Fields (Base Data) - Form 600

Table 2. Fixed Length Data Fields - Definitions

Keypunch Columns	Notes
1 - 2	Journal Issue Number
3 - 10	Accession Number. The prefix part of the accession number, i.e., N64, is reversed on the Linear File to read 64N.
11 - 14	Not shown on Fig. 5.
15	Document Classification 1 = Unclassified 2 = Confidential 3 = Confidential Restricted Data 4 = Secret 5 = Secret Restricted Data 6 = Official Use Only
16	Title Classification 1 = Unclassified 2 = Confidential 3 = Secret

Table 2 (Con't.)

Keypunch Columns	Notes
17	Automatic Downgrading and Declassification Group 1 = Group I 3 = Group III 2 = Group II 4 = Group IV
18 - 19	Announcement Subject Category, 01 - 34
20	NASA Supported 1 = Yes 3 = No
21	NOFORN (Documents coded UB, formerly Category 7) 1 = Document is not in this category 2 = Document is NOFORN/
22	Conference or Symposium Proceedings 1 = Yes 2 = No
23	Corporate Source Supplementary, i.e., there may be more than one organizational level cited in the corporate source name. Subsidiary levels have their own field in the variable portion of the form. 1 = Yes 2 = No
24	Personal Author's Corporate Affiliation. Has its own field in the variable portion of the form. Generally used in cataloging journal articles. 1 = Yes 2 = No
25	Foreign Document 1 = Yes 2 = No
26	Receipt Type 1 = Regular 2 = RQT (Acquisitioned as a result of a document request received). Receipt Type 3 = SQT (Acquisitioned for the system as a result of scanning activity). 4 = Exchange 5 = Loan 6 = DL (Received as a result of being on an automatic distribution list).
27 - 31	Acquisition Number (for internal control purposes only).
32 - 37	Receipt Date (day, month, year)
38 - 43	Report Date (day, month, year), i.e., date of publication.

Table 2 (Con't.)

Keypunch Columns	Notes
Not Keypunched	Number of copies received.
44	Abstract 1 = Facility prepared 2 = Author prepared 3 = Contents Note, in lieu of abstract 4 = None
45	Abstract Language 1 = English 2 = Other
46 - 47	Document Language 1 = English 2 = Mixed 12 - 99 = Country Code
48	Reproducible 1 = Yes 2 = No, i.e., copyright, reprint, reproduction prohibition, etc. 3 = No, poor quality
49	Copyright 1 = Yes 2 = No
50	Microfiche to be made 1 = Yes 2 = No
51 - 52	Document Type 00-04 = NASA documents varying by distribution limitation 05-09 = Non-NASA documents varying by distribution limitation
53	Microfiche Code Prefix
54	Microfiche Code Suffix
55	Document Class 1 = Report 2 = Reprint 3 = Preprint 4 = Journal Article 5 = Other
Not Keypunched	Numbering. In the composite item were all sections analyzed or only selected sections?

Table 2 (Con't.)

Keypunch Columns	Notes
Not Keypunched	Technical Evaluator's initials and date of evaluation.
Not Keypunched	Cataloger's initials
Not Keypunched	Duplicate check positive or negative. If positive give accession number.
Not Keypunched	Routing. Used if item rejected, also for any special evaluator notes.
56	Handling 1 = Single 2 = Analytic Primary 3 = Analytic Subsidiary
57	"Et al" following the author X in box = Yes Box blank = Not applicable
58 - 65	Last Analytic Accession Number. To indicate span of accession numbers used in analyzing this one publication.
66 - 67	Source 01-11 = Sources of special interest to NASA, e.g., AGARD 12-99 = Country Code
68 - 69	Foreign Origin 12-99 = Country Code
70 - 73	Number of pages
74 - 76	COSATI Subject Category (New - Not shown on form)
77 - 80	Not used

2.3.3 Variable Length Data Fields

Full details on the content of the variable length data fields are not necessary for the purposes of this Guide. Therefore, the enumeration in Table 3 is somewhat cursory. However, full details may be found in Reference 5.

Table 3. Variable Length Data Fields - Definitions

Field	Line	Notes
44	19	Temporary number. Control number prior to accessioning.
Price: CFSTI/GPO (Not Keypunched)		For later use by catalogers in Imprint field.
44	07	Date of cataloging Date of cataloging revision
46		Corporate source Code number for corporate source in columns 53-60.
44	08 - 09	Corporate source supplementary
40	1	Title
41	1	Title note
45		Personal author(s)
44	15 - 17	Personal author's corporate affiliation
44	40 - 64	Imprint and notes. Includes collation and price.
48		Contract number(s)
47		Report number(s)
44	21	"Old N-Number." Langley Research Center accession number series.
44	23	(No longer in use)
43	1	Historical notes. "Kills" and their reasons. Notice of supersession.
42	1	Notation of Content (NOC). A revised or expanded title for use in journal indexes.
49	1	Subject index terms. Published terms indicated by a "P".

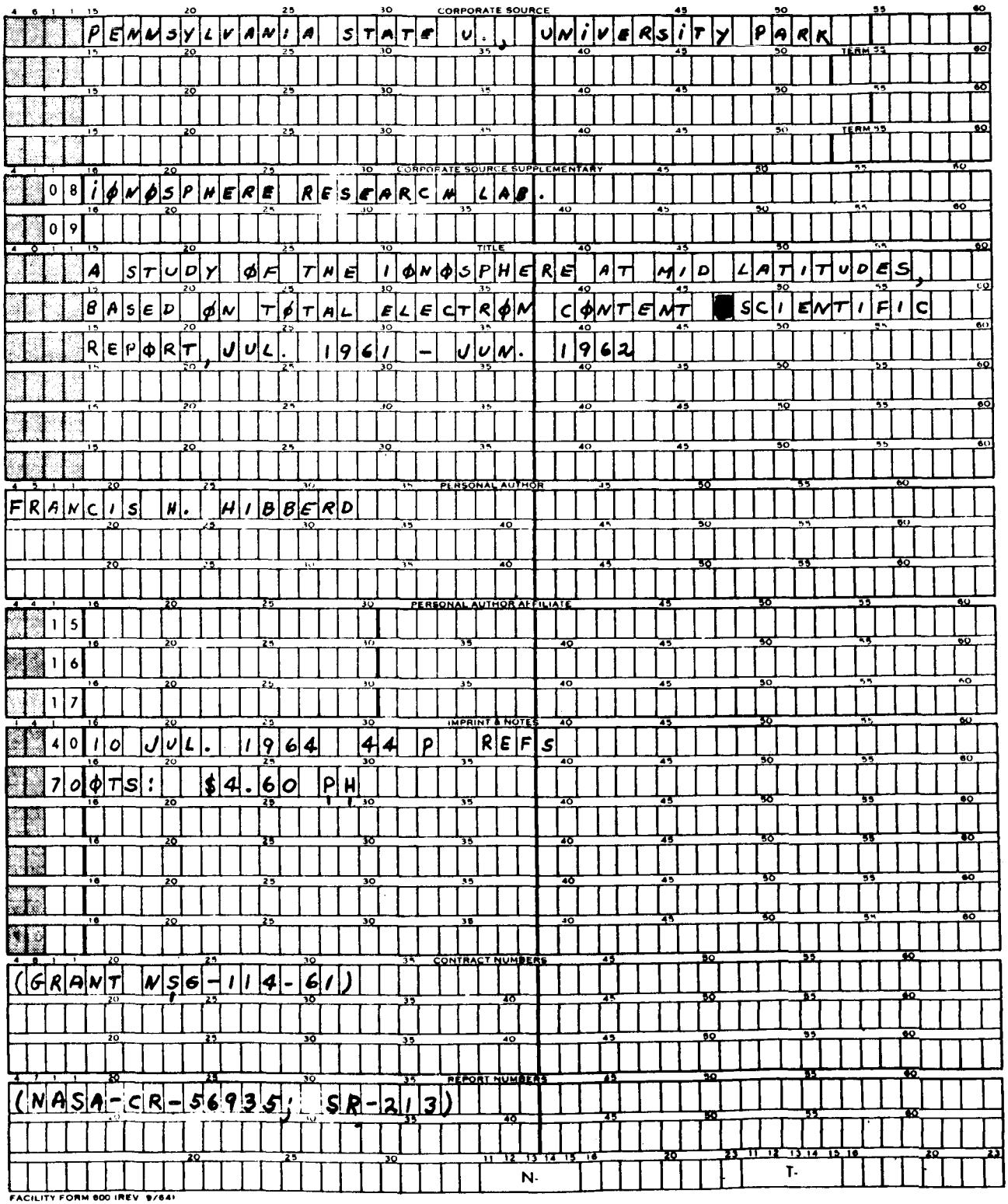


Fig. 6: Variable Length Data Fields (Front) - Form 600

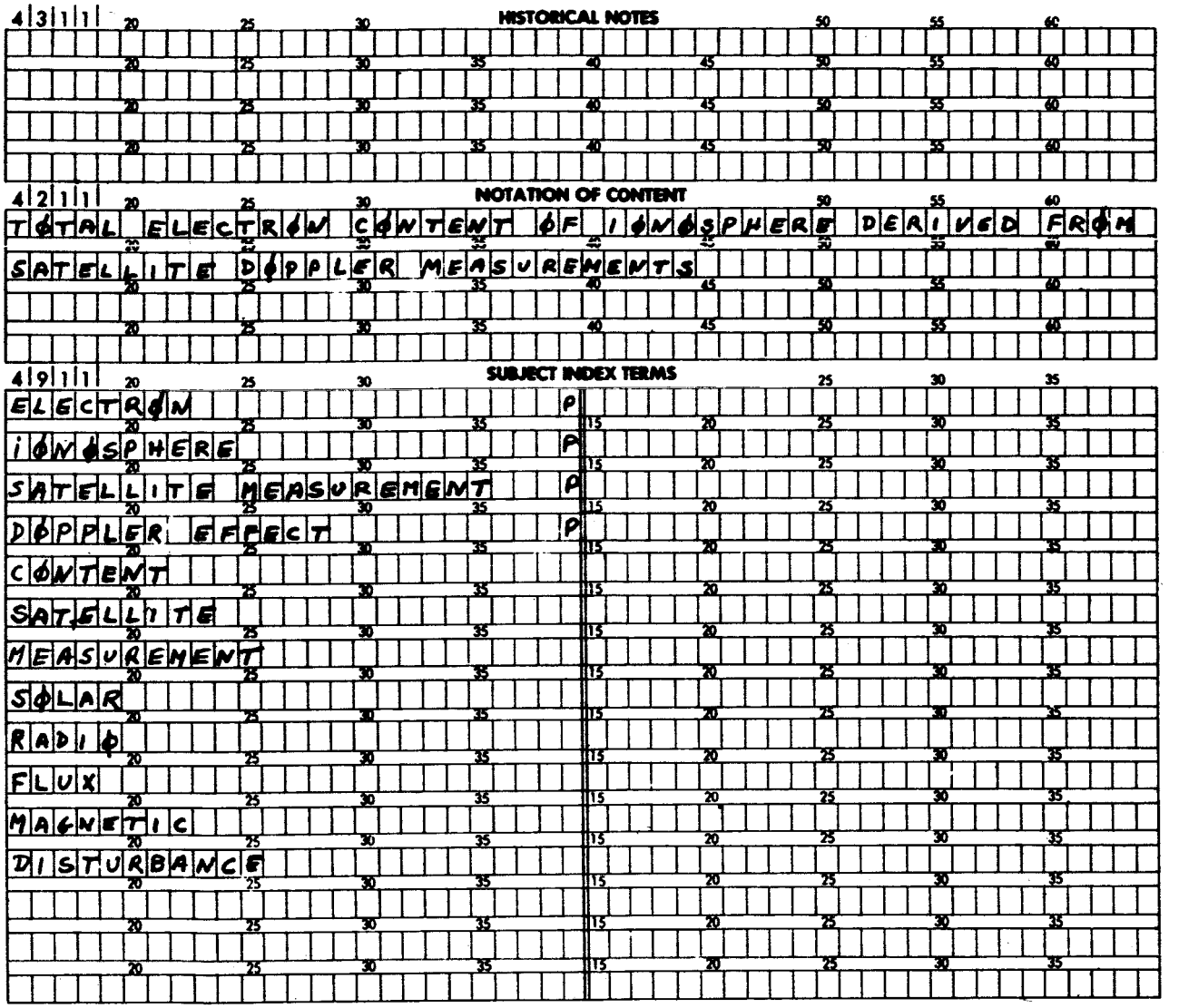


Fig. 7: Variable Length Data Fields (Back) - Form 600

2.3.4 Displays: Form 600 Strip and Tape Dumps

The data on the Linear File for each accession are utilized in a variety of output formats. Selected data are used to compose the citation which is used in Literature Searches (See Section 3.5). Slightly different citations are used for the production of certain miscellaneous computer-produced journals and for the SDI notices.

The total record is generally printed out at the Facility for proofing and checking purposes in one of two formats: the "Master File—Form 600 Strip" or the "Tape Dump." These outputs are illustrated for typical accessions in Figs. 8-11.

The tape dump is almost self-explanatory, presenting the data and the character counts and relative image position exactly as they are on the tape record itself, the

breaks between characters being caused by file word marks. The data are unorganized in this sense and visually difficult to work with.

The Form 600 Strip program presents the data minus all internal housekeeping data, such as the character counts and relative image positions, and organizes them in a more meaningful display. The program makes use of various abbreviations for the headings. These abbreviations are interpreted in the legend on the bottom right hand corner of Fig. 8.

```
                MASTER FILE - FORM 600 STRIP

20-N64-27881      (Issue accession No.)

TEMP    00195886  (Temporary accession No.)

BASE    DC-1, TC-1, DG- , SC-12, NS-1, NF-1, CF-2, CS-1, PA-2, FO-2,
        RT-1, AN-      , RE-300764,RD-100764,
        AB-2, AL-1, DL-01, RE-1, CO-2, MI-1,
        DT-00   MP-1, MS- , DC-1, HA-1, ET- ,   LA-        ,SO-02, FO-  ,  NP-0044
          day mo yr
CATL    CO-110864,  RD-    (Revised cataloging date)
          (Cataloging date)
CORP    20119400 PENNSYLVANIA STATE U., UNIVERSITY PARK. (Corporate source)

CPSP    IONOSPHERE RESEARCH LAB. (Corporate source supplementary)

TITL    A STUDY OF THE IONOSPHERE AT MID LATITUDES,
        BASED ON TOTAL ELECTRON CONTENT  SCIENTIFIC
        REPORT, JUL. 1961 - JUN. 1962

AUTH    HIBBERD, F. H.

PAAF    (Personal author affiliate)

IMPR    10 JUL. 1964  44 P  REFS     (Imprint data)
        OTS-  $4.60 PH

CNTR    NSG-114-61   (Contract No.)

REPT    NASA-CR-56935  (Report No.)      SR-213
                                           N-              T-

HIST    (Historic note:  "Kills" and reasons)

NOC     TOTAL ELECTRON CONTENT OF IONOSPHERE DERIVED FROM
        SATELLITE DOPPLER MEASUREMENTS

TERM    1CONTENT              (1 = unpublished term)
        1DISTURBANCE
        3DOPPLER EFFECT       (3 = published term)
        3ELECTRON
        1FLUX
        3IONOSPHERE
        1MAGNETIC
        1MEASUREMENT
        1RADIO
        1SATELLITE
        3SATELLITE MEASUREMENT
        1SOLAR
```

BASE CODE

DC	Document classification
TC	Title classification
DG	Declassification group
SC	Subject category
NS	NASA support
NF	No foreign
CF	Conference
CS	Corporate source suppl
PA	Personal author affil
FO	Foreign
RT	Receipt type
AN	Acquisition No.
RE	Receipt date
RD	Report date
AB	Abstract
AL	Abstract language
DL	Document language
RE	Reproducible
CO	Copyright
MI	Microfiche
DT	Document type
MP	Microfiche code prefix
MS	Microfiche code suffix
DC	Document class
HA	Handling
ET	Et al
LA	Last analytic accession
SO	Source
FO	Foreign origin
NP	Number of pages

Fig. 8: Form 600 Strip—Annotated

2.4 LINEARIZATION OF 1962/63 DATA

The Form 600 was initiated in June 1964. All previous data could not be formatted entirely in the new way due to the enormous workload involved. The following compromise was effected:

1964 Accession Series, and Forward

All existing data in these series have been transferred into the linear format. All fields are completed. See Fig. 9.

```
                MASTER FILE - FORM 600 STRIP

12-N64-19914

TEMP

BASE    DC-1, TC-1, DG- , SC-07, NS-3, NF-1, CF-2, CS-1, PA-2, FO-2,
        RT-1, AN-      ,  RE-140564,RD-000064,
        AB-2, AL-1, DL-01, RE-1, CO-2, MI-1,
        DT-05   MP-3, MS- , DC-1, HA-1, ET- ,   LA-          ,SO-04, FO-   ,  NP-0017

CATL    CD-190564,  RD-

CORP    08869000 DU PONT DE NEMOURS /E.I./ AND CO., AIKEN, S.C.

CPSP    SAVANNAH RIVER LABS.

TITL    REMOVAL OF CESIUM FROM EVAPORATOR CONDENSATE

AUTH    PROUT, W. E.                    RUSSELL, E. R.

PAAF    PROUT, W. E. /AFSC/

IMPR    MAR. 1964  17 P
        OTS-  $0.50

CNTR    AT/07-2/-1

REPT    DP-876
                                          N-              T-

HIST

NOC     ION EXCHANGE PROCESS FOR REMOVING CESIUM 137 FROM
        AGED RADIOACTIVE WASTE SOLUTIONS

TERM    1AGE
        3CESIUM 137
        1CONDENSATION
        1CYCLE
        1EVAPORATION
        1EXCHANGE
        1ION
        3ION EXCHANGE
        3RADIOACTIVE WASTE
        1RADIOACTIVITY
        1REMOVAL
        1SOLUTION
        1WASTE
```

Fig. 9: Form 600 Strip—1964 Data

```
                MASTER FILE - FORM 600 STRIP              JANUARY 17, 1966

14-N62-15081

TEMP

BASE    DC-1, TC-1, DG- , SC-19, NS-3, NF-1, CF-2, CS-1, PA- , FO- ,
        RT- , AN-      , RE-       ,RD-200462,
        AB- , AL- , DL-  , RE- , CO- , MI-1,
        DT-     MP-3, MS- , DC- , HA- , ET- , LA-     ,SO-   , FO-   ,  NP-0091 COSATI-

CATL    CD-       ,  RD-

CORP    11083800 GENERAL ELECTRIC CO., SCHENECTADY, N.Y.

CPSP    KNOLLS ATOMIC POWER LAB.


TITL

AUTH    DIGHT, D. G.                    JONES, A. B.

PAAF

IMPR    N62-15081  KNOLLS ATOMIC POWER LAB., SCHENECTADY,
        N.Y. HYDRODYNAMIC STABILITY OF A BOILING
        CHANNEL-PART 2. A. B. JONES AND D. G. DIGHT.
        APRIL 20, 1962.  91 P.  2 REFS. /CONTRACT
        W-31-109-ENG-52/ /KAPL-2208/  OTS-  $2.25.


CNTR    W-31-109-ENG-52

REPT    KAPL-2208
                                        N-              T-

HIST

NOC     HYDRODYNAMIC STABILITY OF A BOILING CHANNEL

TERM    3BOILING                                        3CHANNEL
        1COMPUTER                                       1COOLANT
        1CORRELATION                                    1DIGIT
        1DISCONTINUITY                                  1FACTOR
        1FRICTION                                       3HYDRODYNAMICS
        1INPUT                                          1MAGNITUDE
        1MINIMIZATION                                   1MODIFICATION
        1OUTPUT                                         1PARALLEL
        1PROGRAM                                        1REGIME
        1SIMPLIFICATION                                 3STABILITY
        1SUBCOOLING
```

Fig. 10: Form 600 Strip—1962/63 Data

1962/63 Accession Series

All accessions will be on the file; however, the citation will be moved entirely and as a whole into the "Imprint" field. Base data are not supplied except for NASA Support (Form 600, column 20), Conference data (column 22), Journal Announcement Category (columns 18-19), Corporate Source Supplementary (column 23), Pages (columns 70-73), and, for classified documents, Document Classification (column 15), Title Classification

```
 255F 24 65A 35767 081111  123  2 211           0000655274121053 41          740007        0045      0156      0293 0393
     0405 0632$LAW FOR THE MOTION OF A VISCOUS GAS IN A SHOC KTUBE ¤O ZAKONOMERNOSTI DVIZHENIIA VIAZKOGO GAZ AV UDARNOI TRUBE¤ .$GAS
 FLOW WITH ACCELERATED CONTACT SURFACE AN DATTENUATED SHOCK WAVE AS EXAMPLE OF GAS FLOW NO TEXPLAINABLE BY IDEAL ONE-DIMENSIONAL THE
OR Y$20357 240INZHENERNYI ZHURNAL, VOL. 5, NO. 2, 1965, P .41254-260.  10 REFS.  IN RUSSIAN .$ LASHKOV, A. I. $ 1ACCELERATION
   1ATTENUATION          1BEAM       1CONTACT    1ELECTRON   1FLOW       1GAS        3GAS FLOW   1PARAMETER  1PROBE      1SHOCK
  3SHOCK TUNNEL          3SHOCK WAVE 1SIMILARITY 1SURFACE    3VISCOUS FLOW       1WAVE       $ 1  ENTA 1  K @3 1 %5 CT 1 BEAM  1 F
LOW  1 GAS   1 JJRFA 1 KA2OD 1 L B-. 3 P S55 1 PROBE 3 P8BW7 3 S XOX 1 SHOCK 1 SK%YM 3 UX4 F 1 WAVE $#
 24 65A 35768 076211  013  2 211           0000655274121053 41          740014        0045      0175      0260 0360
0402 0607$HEAT TRANSFER OF A PLATE IN THE SUPERSONIC FLO WOF A RAREFIED GAS ¤TEPLOOBMEN PLASTINY  VSVERKHZVUKOVOM POTOKE RAZREZHENNO
GO GAZA¤ .$HEAT TRANSFER AND EQUILIBRIUM TEMPERATURE OF PLAT EIN SUPERSONIC FLOW OF RAREFIED GA S$20354 140INZHENERNYI ZHURNAL, VOL.
 5, NO. 2, 1965, P .41261-274.  12 REFS.  IN RUSSIAN .$ GORSKAIA, N. M. KOSHMAROV, IU. A.          $ 1AIR       1EQUILIBRIUM
      1FLOW       1GAS        3GAS FLOW   3HEAT TRANSFER          1PLATE      1RAREFACTION          3RAREFIED GAS DYNAMICS 1SUPERSO
NIC 3SUPERSONIC FLOW       1TEMPERATURE          1THIN      $ 1  B2@D 3  4J-@ 1  2&@  1 AIR   3 BRRFS 1 C4GC% 1 FLOW  1 GAS   1 PLA
TE 1 QD  G 1 THIN  3 UX4 F 3 WPIH-$#
 24 65A 35769 097911  323  2 211           0000655 74121053 41          740009        0045      0304      0412 0511
0523 0794$STRESSED STATE OF A CYLINDRICAL CANTILEVE RSHELL UNDER THE ACTION OF A CONCENTRATED NORMA LFORCE APPLIED TO A FREE EDGE ¤N
APRIAZHENNO ESOSTOIANIE TSILINDRICHESKOI KONSOL•NO IOBOLOCHKI PRI DEISTVII SOSREDOTOCHENNO INORMAL•NOI SILY, PRILOZHENNOI K SVOBODNO
M UKRAIU¤ .$STRESSED STATE OF CYLINDRICAL CANTILEVER SHEL LUNDER ACTION OF CONCENTRATED NORMAL FORCE APPLIE DTO FREE EDG E$20367 040
INZHENERNYI ZHURNAL, VOL. 5, NO. 2, 1965, P .41284-292.  6 REFS.  IN RUSSIAN .$ SHARINOV, I. L.$ 1ACTION     1APPLICATION
1CANTILEVER 1CONCENTRATION        1CYLINDER   3CYLINDRICAL SHELL     1EDGE       3EDGE LOADING          1EQUATION   1FORCE      1FR
EE       1NORMAL     1SHALLOW    3SHALLOW SHELL EQUATION          1SHELL      1STATE      1STRESS     1VLASOV EQUATION      $ 1  TR
ES 1  4&O  1 @ AAT 1 A& %X 3 C¤LKX 3 CN6II 1 D ALL 1 EDGE  1 ETR2O 1 FORCE 1 FREE  1 PWDD  1 SHELL 1 STATE 1 UCTID 1 6ORMA 1 7 0IN 3
 7S8BJ$#
#
••• CHARACTER CT 2,786 •••
```

A Series

```
 273H 24 65N 36375 100011  243 12221492EUR151065000664214512105311          80450034        0045      0185      0258 0395 0486 0562
0578 0605 0821$PRODUCTION OF CARRIER-FREE 54MN FOR THE IN -PILE IRRADIATION OF IRON  ¤PRODUZIONE D IMN54 CARRIER-FREE PER IRRAGGIAME
NTO DI FERR OIN REATTORE ¤$PURIFICATION OF CARRIER-FREE MANGANESE-54 FO RIN-PILE IRRADIATION OF IRO N$0716116 5190009488 820420 440B
RUSSELS, EURATOM, JUN. 1964  34 P  REF S41IN ITALIAN, ENGLISH SUMMAR Y70CFSTI-  HC $2.00/MF $0.5 O$ FASOLO, G. B.   MALVANO, R.
ROSA, U.       $ 22840700SOCIETA RICERCHE IMPIANTI NUCLEARI, SALUGGIA          22840700/ITALY/.
      $ EUR-1641.I      $ EURATOM-026-62-4 RISI          $ 1CARRIER    1ETHER      1EXTRACTION 1FLUX       1FREE       1IMPURITY   3IR
ON       3IRRADIATION          1ISOPROPYL  3MANGANESE  1PRODUCTION 3PURIFICATION          1RADIOCHEMISTRY       1REACTOR    1RESIN
      1SEPARATION 1SOLVENT   $ 1  GAUR 1  E 4R 1 C%ACT 1 ETHER 1 FLUX  1 FREE  1 GELVE 3 H2Y-C 3 IRON  1 LO X@ 3 NY&8S 1 RESIN 1 U&
SA 3 14G2A 1 6YRRI 1 64-CU 1 8DQ5 $#
 24 65N 36376 096711  043 12221492EUR151065000564213112105311          80310242        0045      0177      0278 0396 0457 0533
0545 0794$PHOTOSYNTHESIS AND VIRUS MULTIPLICATION I NBRASSICA CHINENSIS L  ¤PHOTOSYNTHESE ET MULTI -PLICATION VIRALE CHEZ BRASSICA C
HINENSIS L ¤$PHOTOSYNTHESIS AND VIRUS MULTIPLICATION IN LEAVE SOF  BRASSICA CHINENSIS L INDUCED BY RIBONUCLEI CACI D$0716116 5190009
489 020409 740MAY 1964  242 P  REFS  IN FRENCH, ENGLIS H41SUMMAR Y70CFSTI-  HC $6.00/MF $1.5 O$ GOFFEAU, A.    $ 09760800EUROPEAN AT
OMIC ENERGY COMMUNITY,                09760800BRUSSELS /BELGIUM/.                                    $ EUR-1648.F      $ 1ACID
 1BIOLOGY    1CHLOROPLAST          1FORMATION  1INFECTION  1LEAF       1MULTIPLICATION       3PHOTOSYNTHESIS       1PLANT      3P
LANT /BIOL/          1RATE       1RIBONUCLEIC          3RIBONUCLEIC ACID      1STIMULATION          1VEGETATION 3VIRUS      $ 1   ¤
58 3  B&S  1  O/T% 3 &O—N 1 ACID  1 -%  C 1 LEAF  1 MO TF 1 N C1A 1 PLANT 1 RATE  1 UK-BB 3 VIRUS 3 4L3%E 1 5JOLO 1 6  X.$#
 24 65N 36377 076711  043 12221492EUR151065000665213112105311          80150021        0045      0172      0218 0354 0415 0431 0447
0474 0624$STUDIES ON THE PREPARATION OF LABELLE DPROTEINS AND PEPTIDES  ¤RECHERCHES SUR L APREPARATION DE PROTEINES ET DE PEPTIDE SM
ARQUES ¤$PREPARATION OF LABELLED PROTEINS AND PEPTIDE S$0716116 5190009902 420409 740BRUSSELS, EURATOM, JUN. 1965  21 P  REF S41IN F
RENCE, ENGLISH SUMMAR Y70CFSTI-  HC $1.00/MF $0.5 O$ LEONIS, J.     $ 05326300BRUSSELS UNIV. /BELGIUM/.                                  $
EUR-1845.F      $ EURATOM-006-61-10 RISB       $ 1ACID       1AMINO      1BIOCHEMISTRY         1BIOSYNTHESIS         1EGG        1
LABELLING  3PEPTIDE    1PREPARATION          3PROTEIN    3SYNTHESIS  1WHITE      $ 1  8X2L 1 $YO X 1  H PO 1  5 J$ 3  @OTE 1 ACID  1
 AMINO 1 EGG   3 PO%1H 3 T PTI 1 WHITE$#
#
••• CHARACTER CT 2,972 •••
```

N Series

Fig. 11: Linear File—Tape Dump

(column 16), Automatic Time-Phased Downgrading Group (column 17), and NOFORN (column 21). In the variable portion of the record, Corporate Source, Personal Author, Contract Number, and Report Number are formatted. See Fig. 10.

As will readily be seen, this "partial linearization" of the 1962/63 data affects the system of "Limits" established for the search system only by having neglected the Document Type Code. Searches by Document Type must, therefore, be limited to 1964 and later data.

2.5 CODED TERMS

In order to realize efficiencies in subject term searching and to reduce total search time, the concept of the "coded term" was developed. Each subject term (no matter what its size) in the vocabulary, on being added to the vocabulary, is programmatically assigned a permanent five-character code made up of numeric (0-9), alpha (26), and special (23) characters. The code is developed automatically by a special program which attempts to "randomize" the selection of codes in such a way that there will be next to no chance of the same code being selected for different alpha terms. Subject terms consisting of five characters or less, when coded, are represented by themselves plus the necessary blanks to total five. (There are 59^5 possible five-character codes.) The size of the vocabulary is currently 17,695 terms, of which 12,000 are published terms.

Coded terms are in the previously described "coded term" fields of each Linear File record, immediately after the subject terms themselves. They are also recorded in the Master Vocabulary tape file where the code for any term may be looked up. All subject searches are made on these five-character combinations rather than on the full, and often quite lengthy, alphabetic subject term. Considerable search time is saved thereby. The difference between this system and a conventional term encoding system is that the encoding and the lookup are all strictly internal to the computer system. Coded terms are of no use to the searcher who need never see them; the searcher will continue to specify normal alphabetic subject terms in his inquiries.

Schematically, the subject term fields and their equivalent coded term fields may be visualized as in Fig. 12. The numerals 1 and 3 preceding the terms designate unpublished and published terms, respectively, and constitute the sixth character in each segment.

Coded terms were introduced with the 1401 Linear Search System and have been added as an improvement to Model II of the 1410 System. Sample coded terms can also be seen in the tape dumps of Fig. 11.

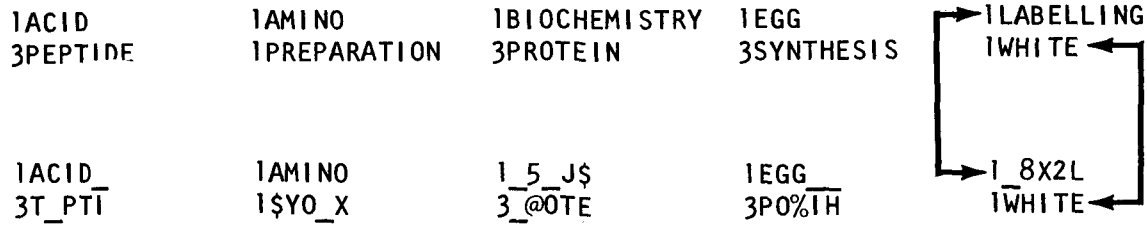


Fig. 12: Subject Terms and Their Coded Equivalents

2.6 AUTOMATIC POSTINGS CONTROL SYSTEM (APC)

APC is a new control system that is in the process of being applied to the Linear File at this writing. It has the primary function of controlling postings. The system is designed to validate transactions, add and delete transactions, operate as an automatic delete and transfer system, act as input to vocabulary listings, automatically post encoded terms for searching when the alphabetic term is posted, and provide the capability to produce statistical data on frequency of usage, last date used, etc.

APC operates on an inverted file concept with each term carrying all its postings. A maximum of 100 records of 300 accessions each will be possible for each term. The system is designed so that all incoming transactions, both to the Linear File and to the Vocabularies, will be validated both on a match and an accession basis. For example, if a corporate source is to be posted to an accession, it will be checked for the proper term number and duplicate checked in the Vocabulary Authority before the actual update. Also, when a term is deleted from the Vocabularies, automatic update transactions will be produced to delete that term from the Linear File. In this way there is an exact correspondence maintained between the Vocabulary Authorities and the Linear File, the former being in fact inversions of the latter.

This system will eliminate a problem that had been experienced of terms being in the Linear File and not in the Vocabularies, and vice versa. Vocabulary listings will be created from the APC tapes and their value in the searching function will be enhanced because of their true reflection of the Linear File.

Each subject term in the Vocabulary Authority will carry with it its encoded version so that the encoded term will always be available for adding whenever the alpha term is added. This will obviate the need to calculate the code anew each time a term already established is being posted. Codes will have to be calculated only once, when a term is first established in the system.

While not part of the present search system, the APC files serve as a good data base for possible future direct access inverted file applications (see Fig. 3).

PART 3. RETRIEVAL (OUTPUT)

3.1 GENERAL

The evolutionary sequence that Facility retrieval programs have followed has been touched upon in the section on File Organization and illustrated in general terms in Fig. 3. To recapitulate briefly:

Period	File Organization	Retrieval System	Reference
1962-64	Inverted term files for searching, with linear citation files for output	IBM-1401 Inverted System	2
1965-66	Linear File with complete data for searching and all outputs	1. IBM-1410 Linear System Model I (Jan. 1965)	11
		2. IBM-1401 Linear System (July 1965)	18
		3. Non-Facility Systems, e.g., IBM-7090; CDC-3600	12, 17, 20-22
1966	Linear File continued–Addition of APC inverted term tapes to be used in conjunction with basic Linear File for posting control and term listings, etc.	1. IBM-1410 Linear System, Model II	This Report
		2. APC has no direct effect on retrieval systems	
1967	Inverted File and Sequential File, both on large direct access devices	IBM System/360	--
		1. Tape System	
		2. Direct Access System	

The 1410 Model II Linear Search System which will be used in 1966 utilizes IBM's 1410/1470 Operating System. The minimum configuration is as follows:

(1) Process overlap and priority special features

(2) 40K Memory

(3) 1402 or 1442 Card Reader

(4) 1403 Printer and 5 Tape Drives (729 II, IV, V, VI, or 7330)

or

(5) Six tape drives without printer.

Part 3—Retrieval: Searching

The following sections will describe the retrieval activity essentially as it goes on at the Facility. Organizations within the NASA decentralized tape program modify this activity in various ways to suit their own operating environments. Descriptions of some of these systems can be found in References 12, 17, 20-22.

The emphasis in what follows will also be on the retrieval process per se rather than as one aspect of customer service provided by the Facility. The details of how requests for literature searches are received, what criteria are used to validate them, and the variety of responses that may result and statistics that are kept will not be touched upon beyond the presentation of Fig. 13, the standard form letter response to a request for literature search.

Experience with the retrieval system has varied widely among users. As with any retrieval scheme, there is no substitute for the kind of persistent and continued use which reveals the system's idiosyncrasies. The most satisfied users tend to be those who are searching most heavily. The Facility itself (Reference Department) has prepared, edited, and delivered over 1,000 searches in 1965, all of which, if not exclusively machine searches, received their major contribution from a machine search. Feedback from the recipients of these searches has been almost uniformly favorable. An occasional criticism has been that the literature searches have tended to be too liberal and have included some marginal items. Upon analysis, this was attributed to the fact that Facility analysts had in the past worked from written questions, without direct contact with the requester. When in doubt, it was safer to leave the items of marginal relevance in. To improve communications between the requester and the analyst, the latter is now being urged to effect telephone contact in any instance where clarification seems advisable. The analyst is also being asked to actively stress the system of "limits" to the users. Essentially this involves making the point that a search of the entire file takes time and that every restriction that can be applied automatically lessens the search time involved. Also, requests which limit themselves to the Facility's store can be delivered many times faster than requests involving retrospective search in other sources.

A rough, immediately available measure of the effectiveness of any given search is the ratio of total accepted items (after editing) to total initial hits (before editing). Expressed as a percentage, this "Acceptance Ratio" has averaged approximately 60% for Facility searches. (This and additional search analyses are described in more detail in Section 3.3.2 Post-Search Analysis.) This ratio reflects the general Facility policy of preparing exhaustive searches unless the request specifies otherwise. Exhaustive or comprehensive searches, which attempt 100% recall or the location of all relevant items in the collection on the given subject, necessitate the writing of "loose" search specifications. That is to say, in order to retrieve all pertinent references the analyst must cast his net over a wide area. This entails the simultaneous retrieval of some non-pertinent references, which must be eliminated by human editing. The result is a search which achieves good recall and good relevance, via a combination of computer versatility and human intelligence.

3.2 SEARCHING: LINEAR FILE SEARCH WORKSHEET (Facility Form 732)

Facility Form 732 (Fig. 14) replaces the earlier related forms for the Inverted System (451B and 451C) and the 1410 Model I System (606). (Form 629 for the 1401 Linear Search System continues in use.) The new form incorporates the expanded capabilities of the 1410 Model II System.

NASA Scientific and Technical Information Facility

operated for the National Aeronautics and Space Administration by Documentation Incorporated

To:

Post Office Box 33
College Park, Md. 20740

Telephone | Area Code 301
779-2121

Your Reference:

Thank you for your recent request for a literature search. Your interest in NASA's activities and programs is appreciated.

The action that has been taken concerning your request is indicated below.

NASA Literature Searches are available to all offices of the NASA and its contractors, to U. S. Government Agencies, and to domestic universities registered for receipt of NASA publications.

Requests for NASA Literature Searches should be sent directly to the Facility's Machine Search Branch at the above address.

☐ A NASA Literature Search has been prepared in response to your request and is enclosed herewith. We would appreciate any comments concerning its pertinence and completeness.

☐ We are enclosing herewith the existing NASA Literature Search which you requested by name or number.

  ☐ Due to the age of this search you may be interested in receiving more current references. If so, please submit a request in your own terms for a new search.

☐ In the interest of speed and economy, we are transmitting a NASA Literature Search on this subject that was completed at an earlier date. We trust that this will fill your request.

  ☐ An addendum containing the latest available references is also attached.

☐ Our records do not indicate that you are a NASA Contractor or are otherwise qualified for this service, as described in Paragraph 3. Your request has therefore been referred to NASA's Scientific and Technical Information Division for review and you will be further advised.

☐ Your request is for a search on a subject that is not considered within the scope of the aerospace field. It has been routed to NASA's Scientific and Technical Information Division for review and you will be advised.

☐ We are unable to meet the deadline date specified in your request. Your NASA Literature Search will be forwarded on or about _____.

☐ NASA Literature Searches are not available in multiple copies. A single copy is transmitted herewith.

Philip F. Eckert, Chief
Machine Search Branch
Reference Department
NASA Scientific and Technical Information Facility

FFNo 685 Sept 65

Fig. 13: Literature Search Request Response Form

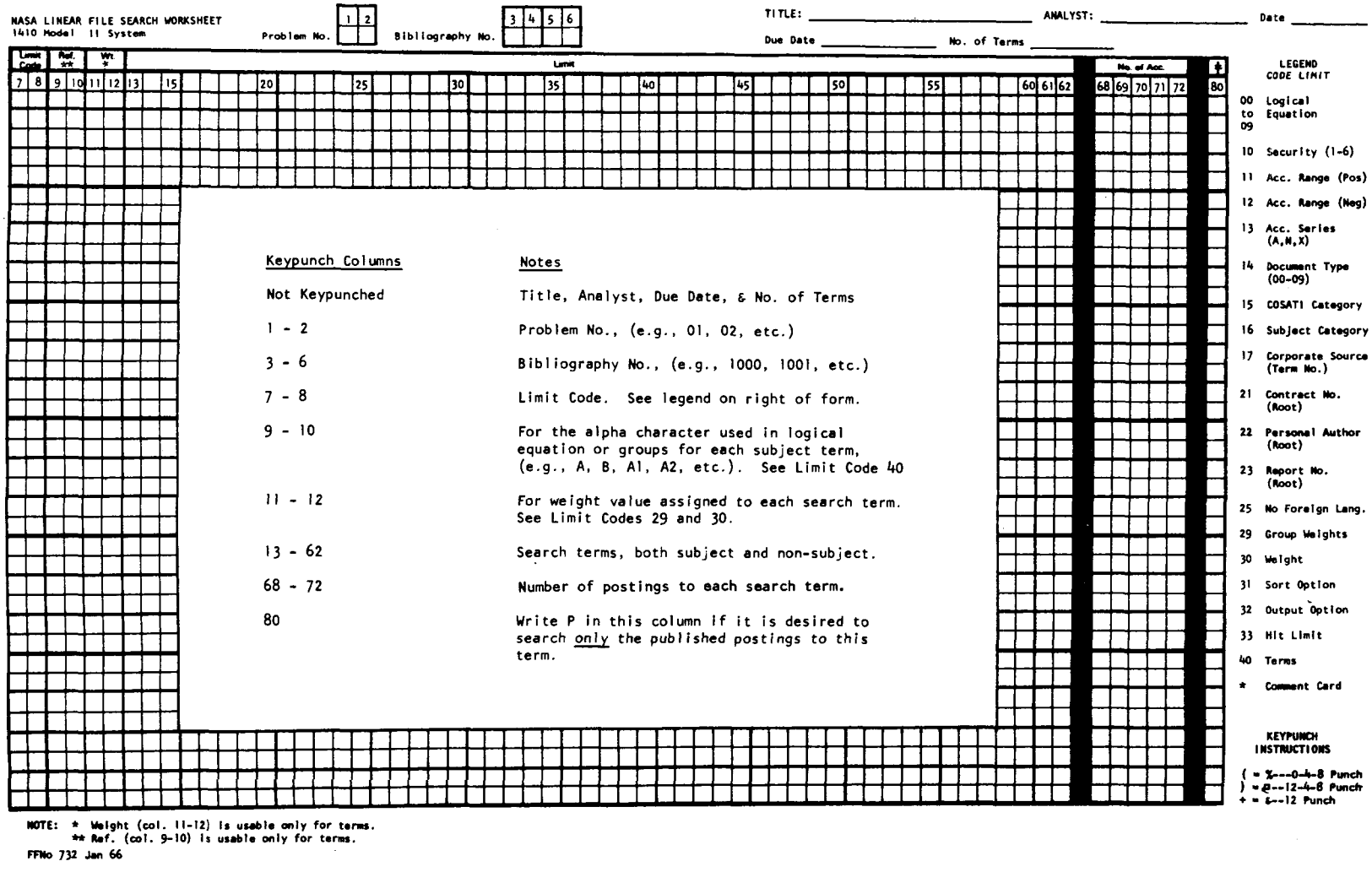


Fig. 14: NASA Linear File Search Worksheet

Part 3—Retrieval: Searching

Originally, searching was restricted to subjects, corporate sources, contract and personal authors. This was expanded, with Model I, to permit searching by a variety of other categories, e.g., document security classification, specific accession number ranges, journal announcement categories, document types, and contract number, report number, and personal author "roots." With Model II, these capabilities have all been retained and added to them are access to the COSATI Subject Category, the ability to specify an arbitrary limit on the number of hits to be printed, a "No Foreign Language" Limit that excludes foreign language documents from search results, and, in the area of term weighting, the ability to specify negative weights and to simulate Boolean equation constraints through the use of "Group Weights," for the sake of increased searching speed. On the Form 732 these various capabilities are all called "Limits" and each has its own two-digit code. Table 4 compares the searching capabilities of the various systems. Descriptions of these and the other limits are given in this section and in the sample problems. The new form dispenses with the need to look up code numbers in Vocabularies (with the sole exception of Corporate Source). It accepts the regular alpha or alpha-numeric version of whatever is being searched. The logical equation is also a direct input. There is no need to rephrase it in any way.

3.2.1 Limits (Non-Subject)

3.2.1.1 Limit Code 10—Document Security Classification. This code is for the purpose of limiting the search to documents of certain security levels.

1 = Unclassified	4 = Secret
2 = Confidential	5 = Secret RD
3 = Confidential RD	6 = Official Use Only

The coding shown in the example in Fig. 15 indicates that the search is restricted to unclassified and confidential documents only. If this card is omitted, the search is unrestricted on this level.

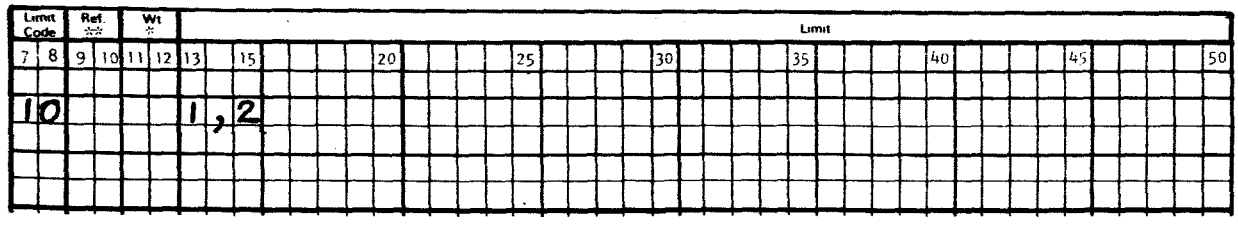


Fig. 15: Limit Code 10—Document Security Classification

3.2.1.2 Limit Code 11—Accession Number Range (Positive Specification). This code is for the purpose of specifying positively the accession number range or ranges to be searched. Only two sets of parameters may be specified in one row. If three sets or more of parameters are desired, use additional cards. Do not split parameters between

Table 4: Search Capability Comparison for 1401 and 1410 Systems

Limit Codes	Search System Capabilities	1401 Inverted	1401 Linear	Model I 1410 Linear	Model II 1410 Linear
00-09	Logical Equation (mandatory or optional)	mand.	mand.	mand.	opt.
10	Security Classification	no	no	yes	yes
11-12	Accession Range	no	yes	yes	yes
13	Accession Series	no	yes	yes	yes
14	Document Type	no	no	yes	yes
15	COSATI Subject Category	no	no	no	yes
16	Journal Announcement Category	no	no	yes	yes
17	Corporate Source	yes	yes	yes	yes
21	Contract No.	yes	yes	yes	yes
22	Personal Author	no	yes	yes	yes
23	Report No.	no	no	yes	yes
25	No Foreign Language	no	no	no	yes
30	Weighting				
	a. single term weights	no	no	yes	yes
	b. negative weights	no	no	no	yes
	c. group weights (Limit 29)	no	no	no	yes
31	Output Sort by Acc. No.	yes	yes	yes	yes
	" " " Weight	no	yes	yes	yes
	" " " Corp. Source	no	yes	yes	yes
	" " " Report No.	no	no	yes	yes
	" " " Subject Category	no	no	yes	yes
	" " " Acc. Series	no	yes	yes	yes
	" " " Contract No.	no	no	yes	yes
	" " " Personal Author	no	no	no	yes
	" " " COSATI Category	no	no	no	yes
32	Output Format with Acc. No.	yes	yes	yes	yes
	" " " Citation	yes	yes	yes	yes
	" " " NOC	no	no	yes	yes
	" " " Terms	no	yes	yes	yes
	" " " Weight	no	yes	yes	yes
33	Hit Limit (Print)	no	yes	no	yes
40	Subject Index Terms	yes	yes	yes	yes
	Comment Card	no	yes	yes	yes
	Root Searching	no	yes	yes	yes
	Coded Terms	no	yes	no	yes
	Max. Terms Per Pass	99	8K:150 12K:400 16K:600	350	1000
	Search Speed per Reel of 14,000 Accessions for 100 Search Items	N/A	35 Min.	50 Min.	20 Min.

cards. Note that the accession numbers are to be written as stored in the Linear File, 65N rather than N65. Examples are shown in Fig. 16.

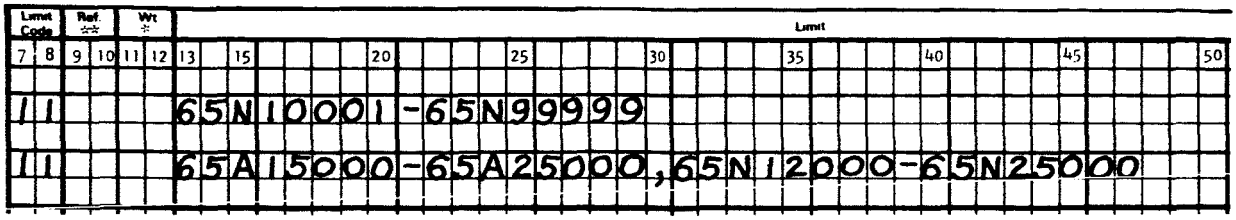


Fig. 16: Limit Code 11—Accession Number Range (Positive Specification)

3.2.1.3 Limit Code 12—Accession Number Range (Negative Specification). This code is for the purpose of specifying the accession number range or ranges which are to be excluded from the search. Only two sets of parameters may be used in one row. If three or more parameters are desired, use additional cards. Do not split parameters between cards. Examples are shown in Fig. 17.

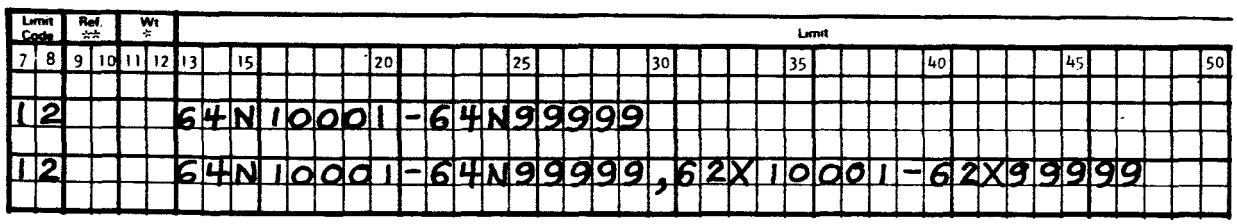


Fig. 17: Limit Code 12—Accession Number Range (Negative Specification)

3.2.1.4 Limit Code 13—Accession Number Series (A, N, X, etc.). This code is for the purpose of specifying which major accessioning series are to be searched. See Appendix C for a description of these major series. Some tape sets may contain additional series, such as B for Tech Briefs, P for Press Releases, etc.

If this card and the cards for Limit Codes 11 and 12 are omitted, the entire file is searched. Examples are shown in Fig. 18.

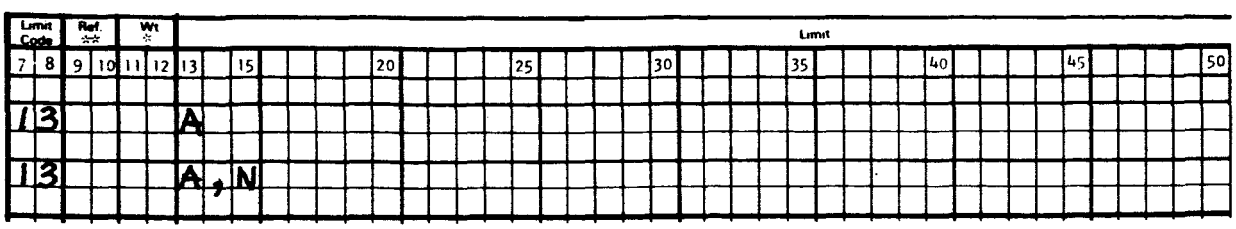


Fig. 18: Limit Code 13—Accession Number Series (A, N, X, etc.)

3.2.1.5 Limit Code 14—Document Type. This code is for the purpose of limiting the search to documents of certain types. Document type is defined as in the table below.

Table 5. Document Type Code (Source/Availability)

Source	Document Type	Unlimited	NASA Only	NASA & Contractor	Government Only	Government & Contractor
	NASA	00	01	02	03	04
	Non-NASA	05	06	07	08	09

The coding shown in the example in Fig. 19 indicates that the search is limited to NASA and NON-NASA documents having no distribution limitations and to those available to NASA and NASA contractors only. If this card is omitted, the search is not restricted at this level.

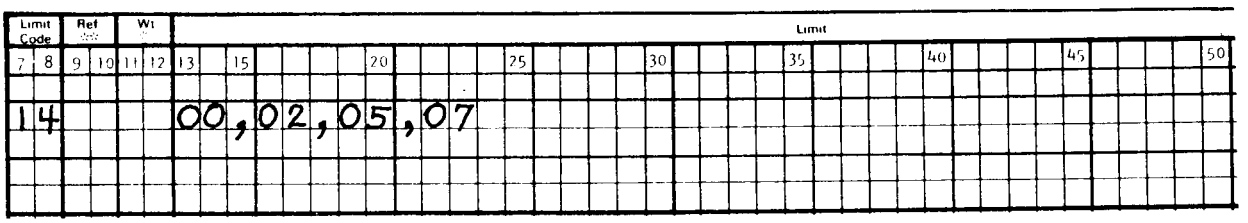


Fig. 19: Limit Code 14—Document Type

3.2.1.6 Limit Code 15—COSATI Subject Category. This code is for the purpose of limiting the search to documents announced in STAR and CSTAR and assigned to particular COSATI categories. These categories are listed in Appendix B, which has been reprinted from Reference 13.

COSATI categories were introduced to the STAR and CSTAR publications commencing with Issue 15, August 1965. Only NASA or NASA-sponsored documents are given COSATI categories. These restrictions must be kept in mind whenever this limit is used.

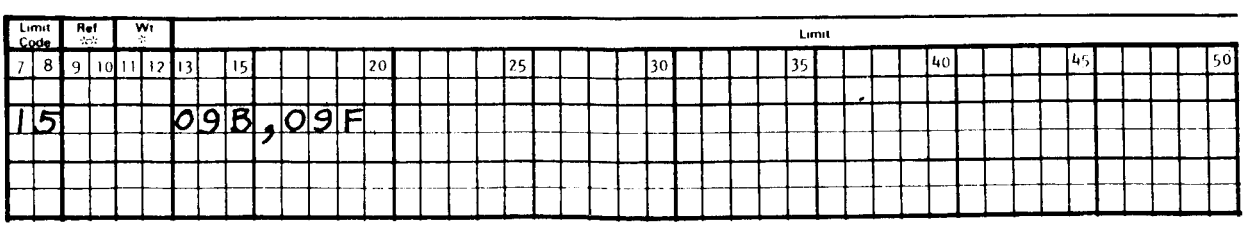


Fig. 20: Limit Code 15—COSATI Subject Category

Part 3—Retrieval: Searching

There are 22 numbered "Fields" in the scheme, each broken down by a varying number of "Groups," with alphabetic designations. Documents are assigned to one Field and one Group and are described in STAR as CSCL 18D, etc.

The example shown in Fig. 20 is a search for COSATI categories 09B and 09F.

3.2.1.7 Limit Code 16—Journal Announcement Category. This code is for the purpose of limiting the search to documents announced in STAR, CSTAR, IAA, etc., in certain categories. Categories are written 01, 02, 03, . . . , 34. The coding in the example in Fig. 21 indicates that the search is restricted to categories 01, 14, and 16 only.

Note: This limit must always be used in conjunction with Limit 11. Journal announcement categories were changed on January 1, 1963 and again on January 1, 1965. Journal announcement categories for 1962, 1963-64, and 1965 are contained for reference in Appendix A.

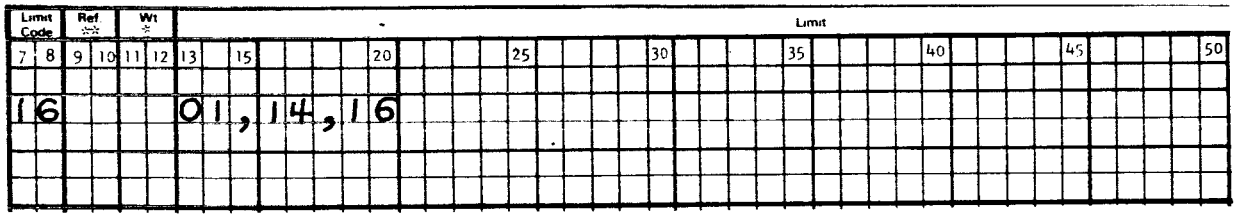


Fig. 21: Limit Code 16—Journal Announcement Category

3.2.1.8 Limit Code 17—Corporate Source. This code is used for a Corporate Source search. A code number from the Corporate Source Authority List must be used to represent the Corporate Source name. An alphabetic input is not permissible in this case. The coding in the example shown in Fig. 22 indicates a search for all documents attributed to Bell Aerosystems Company in Buffalo, New York and in Cleveland, Ohio. The code numbers are taken from the Corporate Source Authority List dated March 4, 1966.

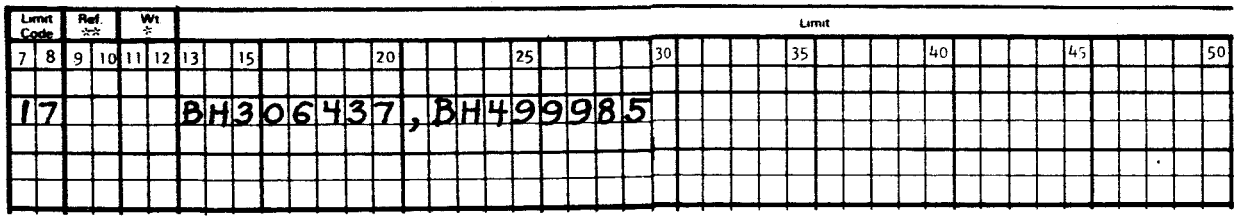


Fig. 22: Limit Code 17—Corporate Source

If a Corporate Source is assigned a weight, along with other terms of the search, then limit Code 47 must be used instead of 17. See Fig. 37.

3.2.1.9 Limit Code 21—Contract Number. A specific contract number, or any part thereof, may be searched. A search may request the specific NAS 7-100 contract or all contracts prefixed with the "root" NAS 7 or the "root" NAS, etc. The input is the alphanumeric contract number itself; no other coding is necessary. Only one contract number (or root) may be specified on a single card. To specify a search not by root but on a specific contract number which may resemble a root, e.g., NAS 7-10, place a dollar sign ($) after the contract number.

If a Contract Number or a Contract Number Root is assigned a weight, along with other terms of the search, then Limit Code 51 must be used instead of 21. See Fig. 37.

The examples in Fig. 23 show, first, three specific searches, and second, two root searches.

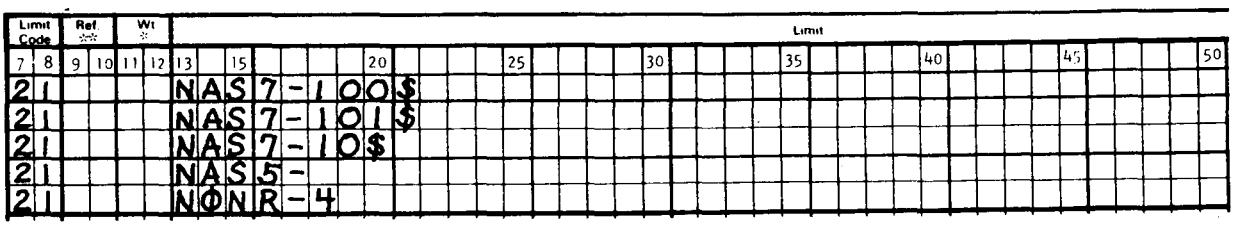


Fig. 23: Limit Code 21—Contract Number

3.2.1.10 Limit Code 22—Personal Author. Follows the same pattern as Contract Number and Report Number. Care must be taken to write the name exactly as it appears in the Personal Author Authority List (not currently being produced) or in the STAR/IAA Indexes.

The example in Fig. 24 shows a search for all documents attributed to G. P. Kuiper. If only the name Kuiper had been written, documents authored by B. Kuiper and J. Kuiper would have also been retrieved.

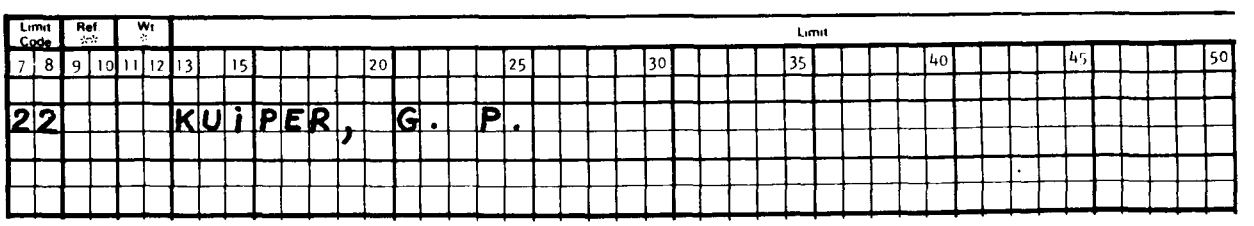


Fig. 24: Limit Code 22—Personal Author

If a Personal Author is assigned a weight along with other terms in the search, then Limit Code 52 must be used instead of 22. See Fig. 59.

3.2.1.11 Limit Code 23—Report Number. Follows the same pattern as Contract Number. The example in Fig. 25 shows a search for all NASA-TN-D's.

If a Report Number Root is assigned a weight, along with other terms in the search, then Limit Code 53 must be used instead of 23.

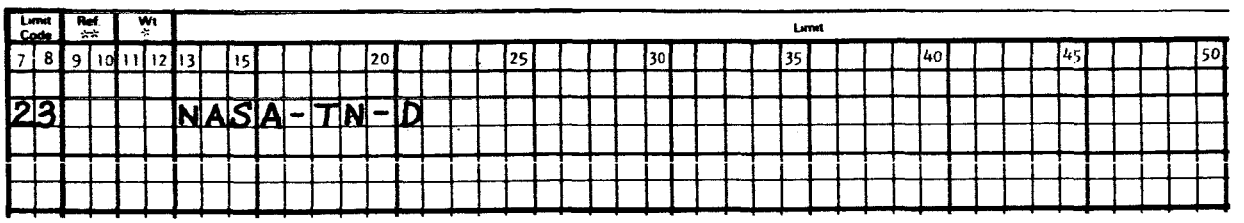


Fig. 25: Limit Code 23—Report Number

3.2.1.12 Limit Code 25—No Foreign Language. This limit code will eliminate all foreign language text documents from the search output. Only the limit code itself is used. See Fig. 26.

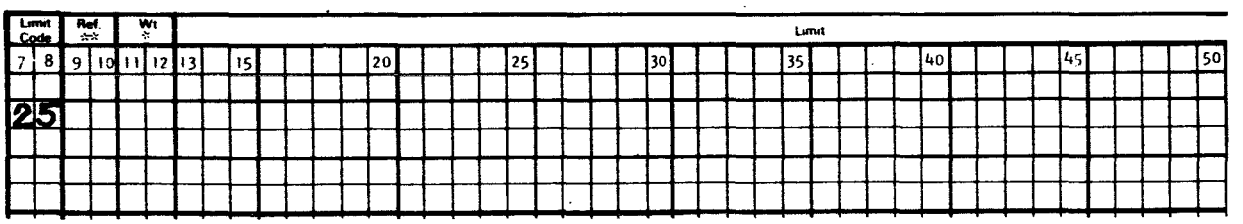


Fig. 26: Limit Code 25—No Foreign Language

3.2.1.13 Limit Code 31—Sorting Options. There are nine possible sorting options for the final output, e.g., accession number; corporate source/accession number; contract number/accession number; etc.

These options and their respective codings are shown in Fig. 27.

ACC = Accession No.
CAT = Category (Subject)
CON = Contract Number
COR = Corporate Source
COS = COSATI Category
PER = Personal Author
REP = Report Number
SER = Series (Accession Series)
WEI = Weighted Value of Item

If Limit Code 31 is omitted from the Worksheet, the program automatically selects the accession number option.

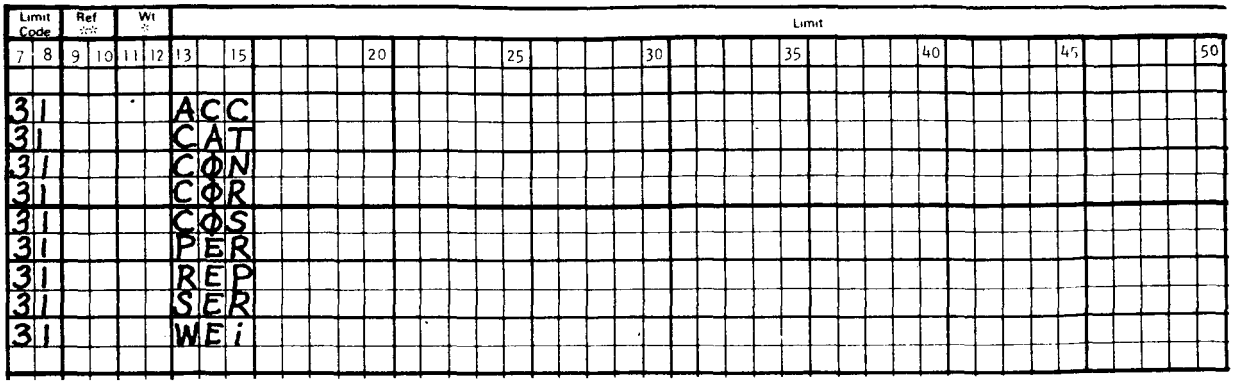


Fig. 27: Limit Code 31—Sorting Options

3.2.1.14 Limit Code 32—Output Format Print Options. There are 16 possible output print options, e.g., accession numbers only; accession number/citation; accession number/citation/subject terms; accession number/subject terms, etc. These options and their respective codings are shown in Fig. 28.

ACC = Accession Number
CIT = Citation
NOC = Notation of Content
TER = Subject Terms
WEI = Weighted Value of the Item

If Limit Code 32 is omitted from the worksheet, the program automatically selects the accession number/citation option. The issue and category are printed for all options.

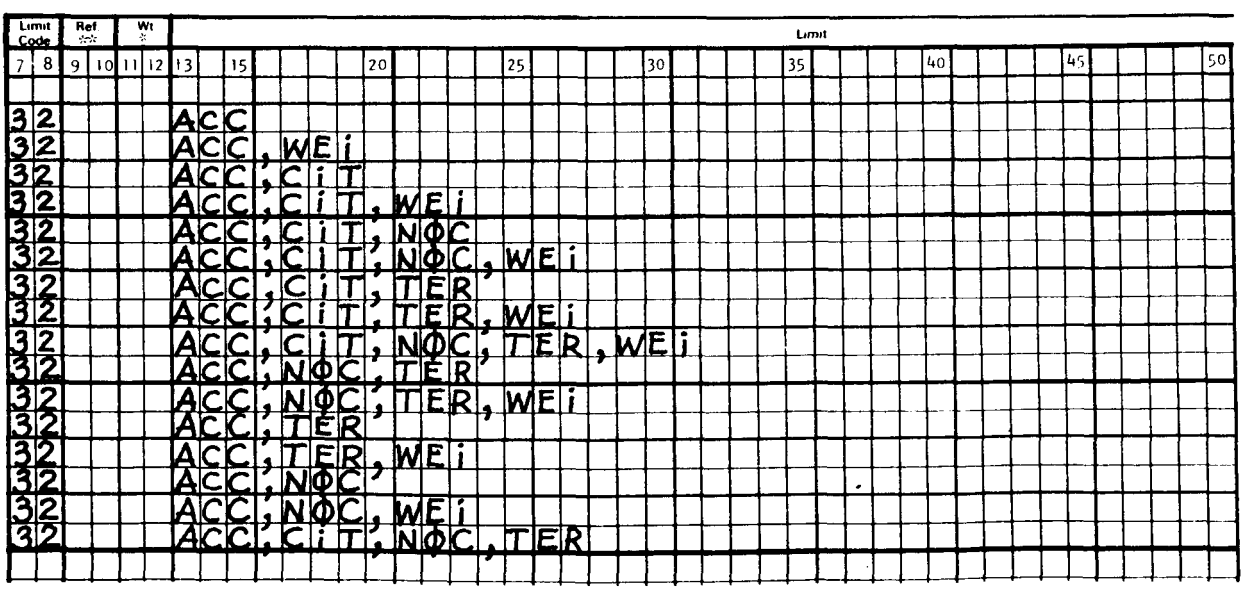


Fig. 28: Limit Code 32—Output Format Print Options

3.2.1.15 Limit Code 33—Hit Limit. This limit restricts the number of answers or hits printed for any problem. Four digits may be used in columns 13-16. In the example

shown in Fig. 29 the printed output will terminate after 400 citations. The Hit Limit should normally be used in conjunction with the Weight Limit (Limit Code 29-30) or a weight value sort option. It can be useful in situations where the output is difficult to anticipate and the analyst wishes to avoid excessive volume.

When the limit is used, the output will appear in reverse accession number sequence, within the particular sort option specified. If the sort option chosen is straight accession number, therefore, the sequence will be 66A, 66N, 66X, 65A, 65N, etc. The 66A-80K will precede the 66A-10K. If the weight sort option is selected, the 1966 accessions will precede the 1965 (or earlier) accessions within any given weight value. The objective is to cause the most recent documents to be displayed and for the printing restriction to apply to the older documents rather than the new and presumably more up-to-date materials.

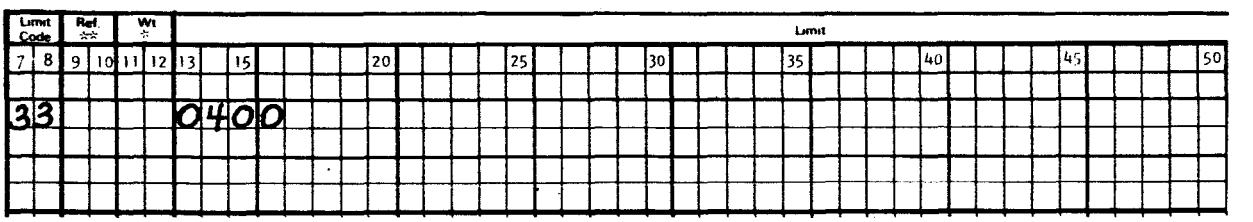


Fig. 29: Limit Code 33—Hit Limit

3.2.2 Subject Terms (Limit Code 40)

Searching by subject index terms is the heart of any information retrieval system. However, in this system the method parallels that used for the various non-subject limits.

As in the previous system, subject terms are of two varieties—the terms used in the published journal indexes (tending toward "pre-coordinations"), and those used only within the machine (tending towards "uniterms"). Unlike the inverted system, which permitted machine searching only on machine terms, both kinds of terms are machine searchable in the Linear System.

Subject terms are specified one term per card, using the Limit Code 40. The terms are written alphabetically, not coded, in columns 13 through 62.

Searching may be limited to the published postings for a given term by writing the letter P in column 80, following the term. Assuming the published indexing picks up the major concepts of a document, such a search may be desired in order to restrict output to very highly pertinent items.

When searching by subject terms, column 9 must contain the alpha character which represents the term in the Logical Equation. Traditionally, the letters A, B, ..., Z are used. If 2 letters become necessary, e.g., AA, BB, etc., they are coded in columns 9 and 10. As will be seen, when group weights are employed, the codes A1, A2, A3, etc., are used. Columns 68-72 are used to record the number of postings for each term.

The number of terms which may be used in any one problem is not limited. A single pass on the computer (40K memory) can accommodate approximately 50 problems using a total of 1,000 terms.

The example in Fig. 30 shows a search on the published term "Supersonic Combustion" and on (the intersection of) the two machine terms "Supersonic" and "Combustion."

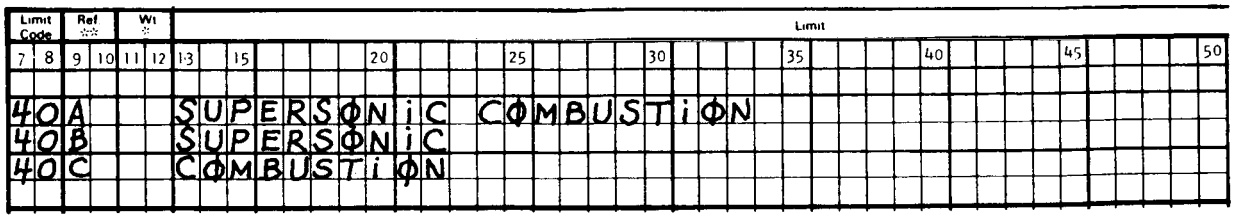


Fig. 30: Limit Code 40—Subject Terms

3.2.3 Logical Equation (Limit Code 00-09)

The Logical Equation is entered under these codes. It specifies, in the familiar language of Boolean Logic, certain relationships between index terms. The terms assigned to any one document must satisfy this relationship in order to be considered "Hits." The first line of the equation should use Code 00 in columns 7 and 8. If the equation is so long as to require a second line, it should be entered under Code 01, and so on. Ten cards may be used for any one equation. Use of an equation is optional. However, either an equation or an assignment of weights (Section 3.2.4) must be used in order to provide the search with selection criteria.

The following restrictions should be followed in writing the equation:

(1) Use + to indicate logical "or"

(2) Use • to indicate logical "and"

(3) Use - to indicate logical "not"

(4) Use parentheses, ( ), (( )), and even ((( ))) to avoid ambiguity

(5) Use $ to terminate equation.

Four examples are shown in Fig. 31.

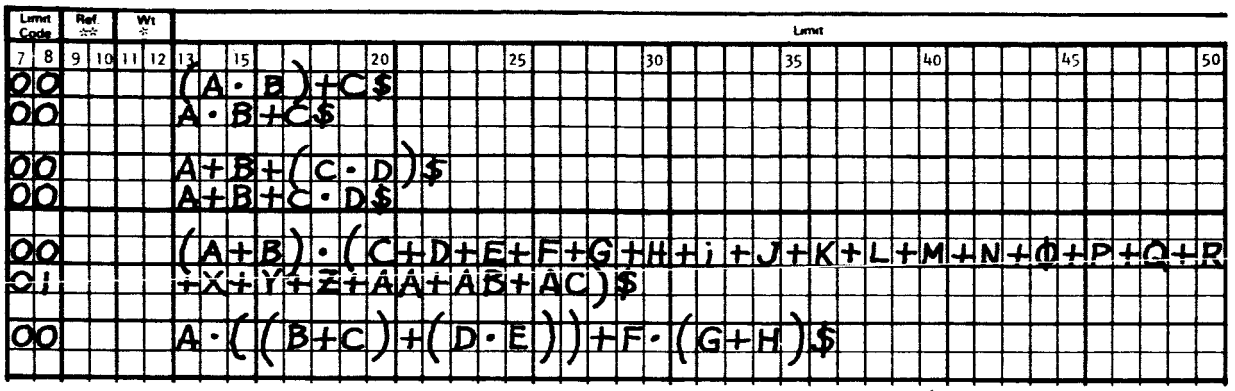


Fig. 31: Limit Code 00-09—Logical Equation

Example 1: L = (A • B) + C

Example 2: L = A + B + (C • D)

Example 3: L = (A + B) • (C + D + E + ... Z + AA + BB)

Example 4: L = A • ((B + C) + (D • E)) + F • (G + H)

Note: Operand "•" must be written in the Logical Equation on the worksheet and cannot be assumed due to the presence of parentheses, e.g., F • (G + H) not F (G + H).

The Logical Equation is keypunched according to the special keypunch instructions on the lower right corner of the Form 732 worksheet. When printed out on the Problem Validation Sheet, the equation therefore appears with different symbols than originally written.

3.2.4 Weighting of Terms (Limit Codes 29-30)

3.2.4.1 Single Term Weights, With Equation (Limit Code 30). Weight values may be arbitrarily assigned to each term, whether subject or non-subject, in the search. These arbitrary numeric values are written in Columns 11-12, right justified. The output of the search may be controlled by specifying that only items having a certain calculated weight, or greater, be retrieved. The output is inversely related to the weight specified, i.e., the higher the weight limit, the smaller the output. The weighting technique can imitate the earlier "analog" technique described in the Guide to the Inverted System (Ref. 2). For example, setting the weight values for all terms in a given search at 1 and specifying a weight limit of 4 would be equivalent to the "analog" demand that retrieved items be indexed by at least 4, but any 4, of the specified terms. However, the weighting technique also permits a search which is simultaneously logical and combinatorial (analog). The example in Fig. 32 demonstrates this more advanced usage.

Assume the logical equation

$$L = (A^5 + B^5) \cdot (C^1 + D^1 + E^1 + F^1 + G^1)$$

Weight values of five have been assigned to A and B; weights of one to C through G. A minimum logical "hit" of A and C would have a weight of six. However, the weight limit specified is seven. Therefore, A or B must be matched up with any two of the terms C through G to achieve a final "hit." Weights are computed in advance of the solving of the logical equation. Items not meeting the required weight are rejected immediately without further processing. However, weight alone is not sufficient to make an item a "hit." Logical constraints must be met in order for weight to have any meaning. In other words, a document indexed under both A and B has a weight of ten and therefore satisfies the weight limit, but if it is not indexed under any of the terms C through G, the logical conditions are not satisfied and it would therefore not become a hit.

Note: The weight limit must be placed in column 13 (or 13 and 14 in the case of two-digit weights and 13, 14, and 15 for three-digit weights) and should not be placed in columns 11 and 12 which are reserved for the individual weight values assigned to terms.

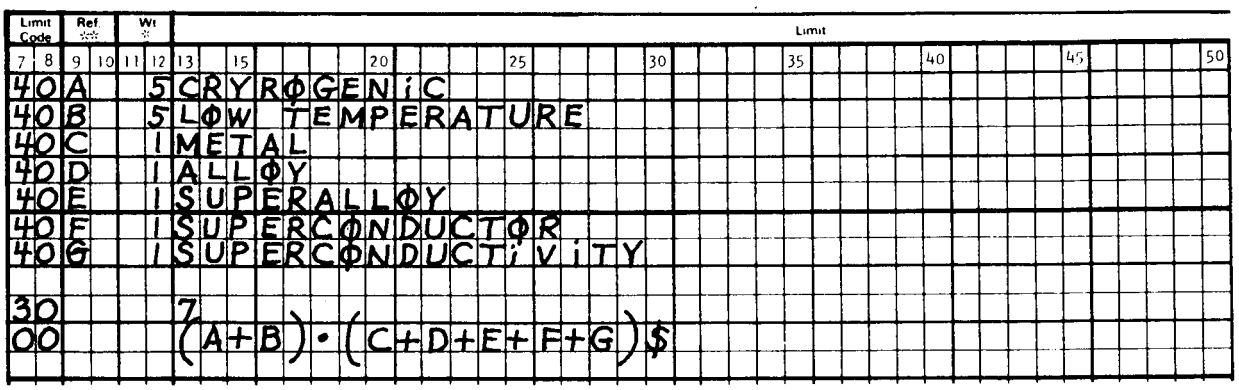


Fig. 32: Limit Code 30—Single Term Weights

It is apparent that document weight becomes a way of ranking search output in order of relevance. Probably the first use that weights were put to within the Facility was not to limit the output—the Boolean equation did this—but to arrange it either for the user or the analyst or perhaps both. This becomes extremely valuable in an environment where search output receives a human edit before it is released. Arbitrary weight levels can be set by the analyst above which relevance to the question is assumed and below which editorial efforts are concentrated.

3.2.4.2 Single Term Weights, Without Equation (Limit Code 30). The weighting technique can by itself in some situations achieve exactly the same results as a Boolean equation. In this sense, skillfully assigned weights can simulate an equation. For example, the equation A · (B + C + D) can be completely bypassed through the following weight assignment: A = 3, B = 1, C = 1, D = 1; Weight Limit = 4.

Other common types of equivalences are the following:

A + B + C + D	A = 1, B = 1, C = 1, D = 1 Weight Limit = 1

Part 3—Retrieval: Searching

A · B · C	A = 1, B = 1, C = 1 Weight Limit = 3
A + (B · C · D)	A = 3, B = 1, C = 1, D = 1 Weight Limit = 3
(A + B) + (C · D)	A = 2, B = 2, C = 1, D = 1 Weight Limit = 2
A · B · (C + D)	A = 2, B = 2, C = 1, D = 1 Weight Limit = 5

Figures 33A-E demonstrate codings of the above statements in both forms, first by weights and second by logical equation. In each case, the alternative codings will produce identical results.

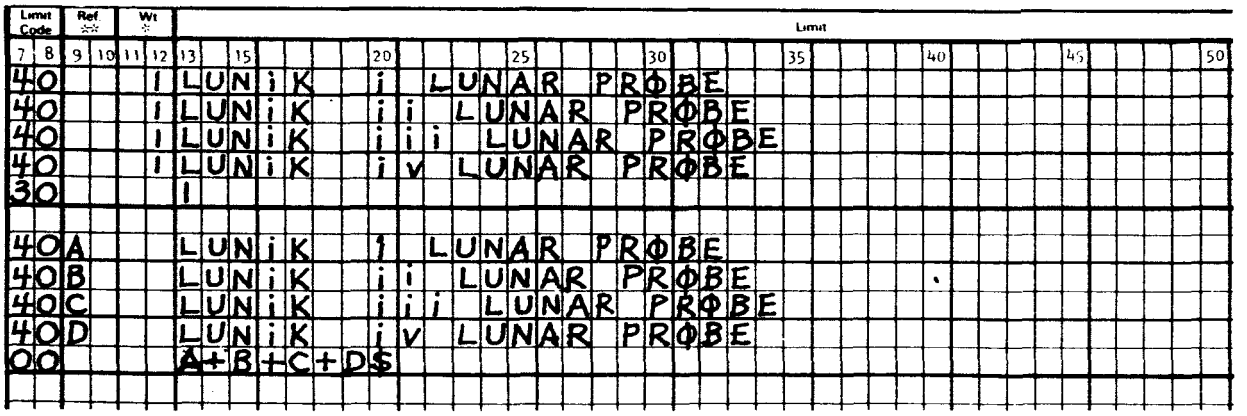


Fig. 33A: Search Coding Alternatives, Weight vs. Equation A + B + C + D

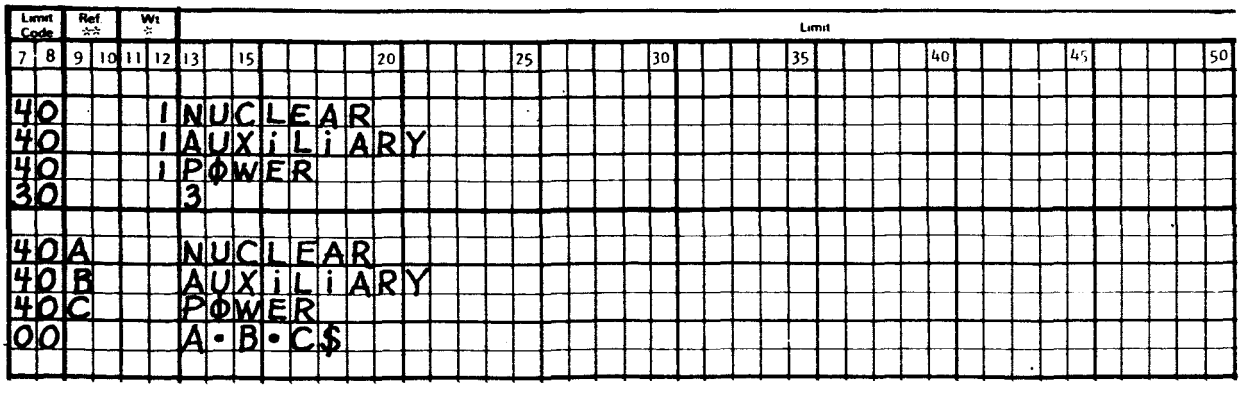


Fig. 33B: Weight vs. Equation A · B · C

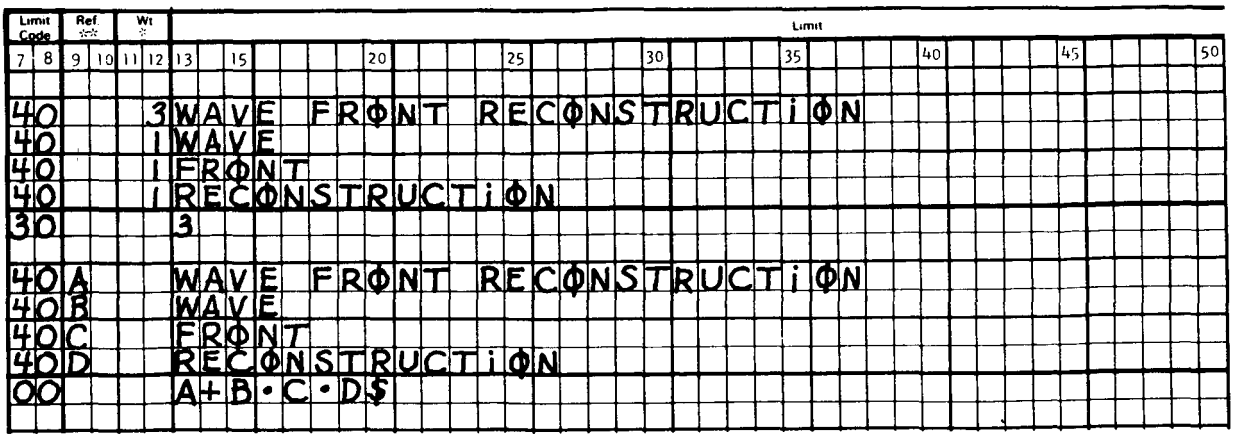


Fig. 33C: Weight vs. Equation A + (B · C · D)

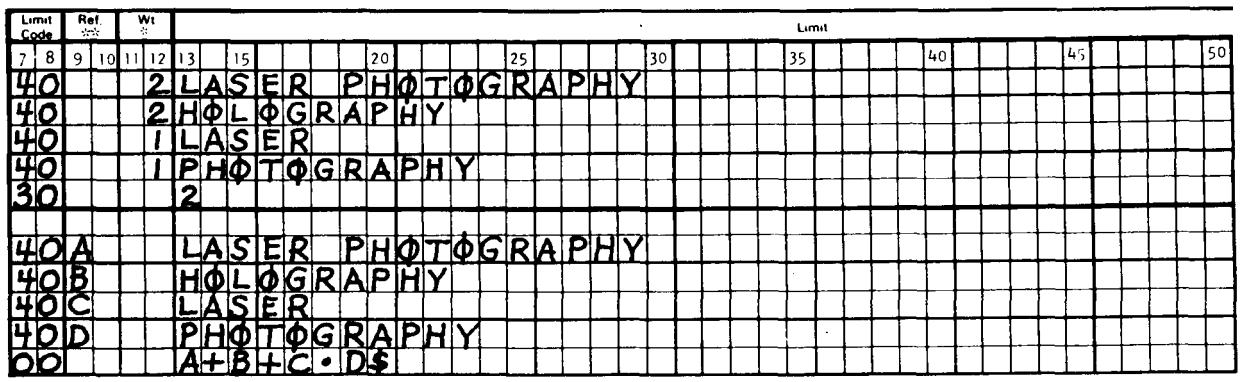


Fig. 33D: Weight vs. Equation (A + B) + (C · D)

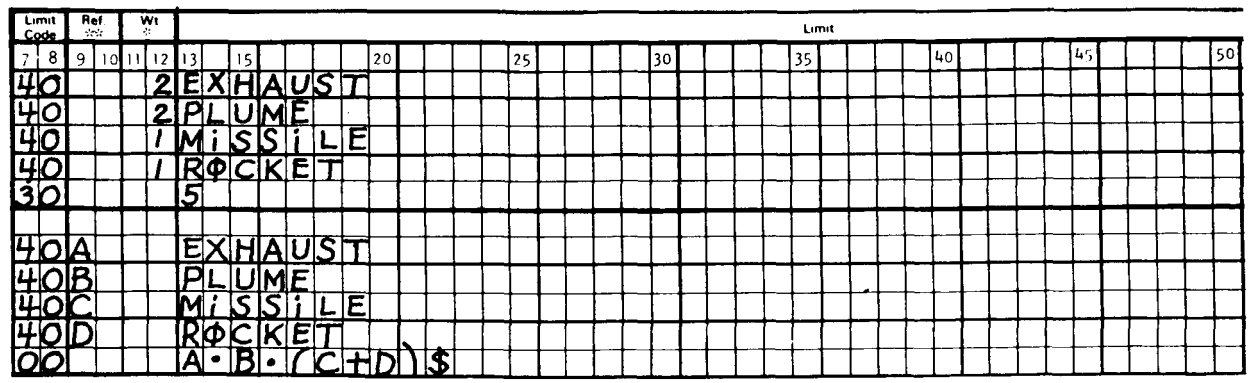


Fig. 33E: Weight vs. Equation (A · B) · (C + D)

3.2.4.3 Group Weights (Limit Code 29). The calculation of weights being a relatively faster computer process than the solving of a Boolean Equation, the substitution of the former for the latter has the potential for a significant increase in searching speeds.

Unfortunately the more complex search statements are frequently not reducible to a system of single term weights, as for example, the two equations (A + B) • (C + D) and (A • B) + (C • D).

To handle the recalcitrant situations it was necessary to develop the technique of Group Weights. Essentially this involves "multiplying out" the equation, identifying its sections or groups, and assigning weights and weight limits for each separate group.

Assume the statement:

(Lunar + Moon) • (Crust + Crater)

(A + B) • (C + D)

If this equation is broken into its major component expressions using the Distributive Law, we have the two groups:

Lunar • (Crust + Crater) Moon • (Crust + Crater)

A • (C + D) B • (C + D)

Following the pattern of designating groups as A, B, C, D, . . . , and the terms in each group as A1, A2, A3, . . .; B1, B2, B3, . . ., we arrive at

Lunar • (Crust + Crater) Moon • (Crust + Crater)

A1 A2 A3 B1 B2 B3

It is apparent that if within each group a weight system of the following type operates:

A1 = 2, A2 = 1, A3 = 1

B1 = 2, B2 = 1, B3 = 1

Weight Limit = 3

Then, the hits produced would be identical to those obtained under the original equation. Fig. 34 shows how this is achieved on the code sheet.

Grouping and weighting of four typical equations are shown in the following examples:

1. Group A / (A + B + C) + Group B / (D • (E + F + G))

A = A1 = Weight 1	D = B1 = Weight 3
B = A2 = Weight 1	E = B2 = Weight 1
C = A3 = Weight 1	F = B3 = Weight 1
Group Weight Limit = 1	G = B4 = Weight 1
(Coded A1)	Group Weight Limit = 4
	(Coded B4)

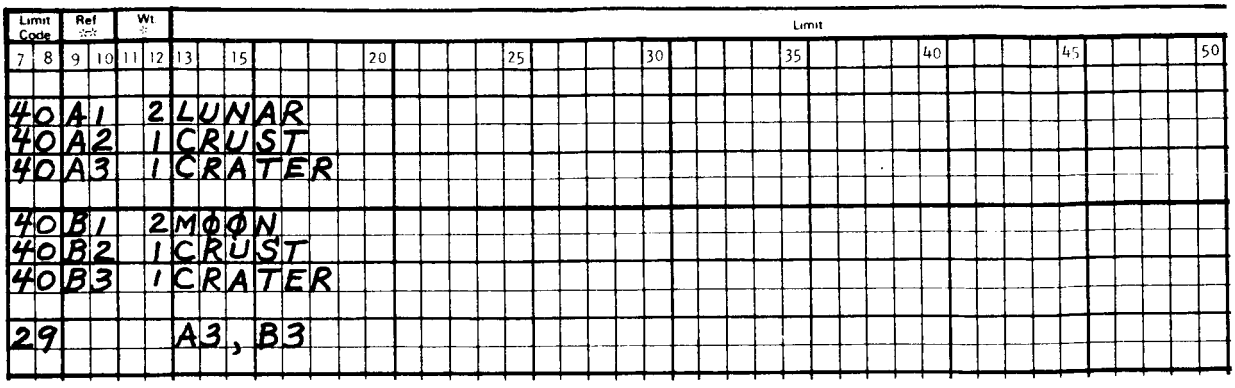


Fig. 34: Limit Code 29—Group Weights, No Equation

2. $\frac{\text{Group A}}{A \cdot B \cdot (C + D + E)} + \frac{\text{Group B}}{(F \cdot (G + (H \cdot I)))}$

A = A1 = Weight 5
B = A2 = Weight 4
C = A3 = Weight 1
D = A4 = Weight 1
E = A5 = Weight 1
Group Weight Limit = 10
(Coded A10)

F = B1 = Weight 4
G = B2 = Weight 2
H = B3 = Weight 1
I = B4 = Weight 1
Group Weight Limit = 6
(Coded B6)

3. $(A + B + C) \cdot (D + E + F)$

Using the Distributive Law, the Groups are:

$\frac{\text{Group A}}{A \cdot (D + E + F)}$

A = A1 = Weight 3
D = A2 = Weight 1
E = A3 = Weight 1
F = A4 = Weight 1
Group Weight Limit = 4
(Coded A4)

$\frac{\text{Group B}}{B \cdot (D + E + F)}$

B = B1 = Weight 3
D = B2 = Weight 1
E = B3 = Weight 1
F = B4 = Weight 1
Group Weight Limit = 4
(Coded B4)

$\frac{\text{Group C}}{C \cdot (D + E + F)}$

C = C1 = Weight 3
D = C2 = Weight 1
E = C3 = Weight 1
F = C4 = Weight 1
Group Weight Limit = 4
(Coded C4)

4. $A + (B + C) \cdot (D + E + F)$

Using the Distributive Law, the Groups are:

$\frac{\text{Group A}}{A}$

A = A1 = Weight 1
Group Weight Limit = 1
(Coded A1)

$\frac{\text{Group B}}{B \cdot (D + E + F)}$

B = B1 = Weight 3
D = B2 = Weight 1
E = B3 = Weight 1
F = B4 = Weight 1
Group Weight Limit = 4
(Coded B4)

$\frac{\text{Group C}}{C \cdot (D + E + F)}$

C = C1 = Weight 3
D = C2 = Weight 1
E = C3 = Weight 1
F = C4 = Weight 1
Group Weight Limit = 4
(Coded C4)

All types of logical equations may be converted to a system of weights, using either single term weights or, if necessary, group weights. However, it is clear that complicated equations can be difficult, repetitious, and laborious to convert into weight coding.

It is always advantageous in terms of computer search time to use weights, even if one only partially converts an equation. This advantage in searching speed must be matched, however, against the fact that the weight technique can easily become too difficult for easy or convenient human use.

On the one hand we have the logical equation with its advantages of being perhaps the most unambiguous and easily comprehensible way a search question, with a complex relationship of terms, can be organized and displayed. On the other hand, we have the weighting technique which results in much faster searches but which rapidly becomes too difficult in the application.

The next step in the evolution of the search program in this area is obvious. The program could be made to accept the equation and calculate its own weight assignments. This is now being evaluated. Meanwhile, both strategies are available, each with their unique advantages.

3.2.4.4 Weighting of Non-Subject Terms. If the non-subject terms (Corporate Source, Contract Number Root, Personal Author, or Report Number Root) are assigned weights, then Limit Codes must be entered on the Search Worksheet as follows:

Limit Code 47 for Corporate Source instead of 17
Limit Code 51 for Contract Number/Root instead of 21
Limit Code 52 for Personal Author instead of 22
Limit Code 53 for Report Number Root instead of 23

See Fig. 59 for weighted non-subject terms.

3.2.5 Negation

Negation may be applied in a search to subject terms or to the following non-subject terms: Corporate Source, Contract Number (or root), Personal Author (or root), and Report Number (or root). Negation should always be used with extreme caution; its power as an exclusive force is frequently underestimated with a consequent loss of relevant material.

For example, a request might stipulate a search on "Hypersonic Flow Research," but to exclude wind tunnel references. It is quite possible for a document on this subject to contain one section on wind tunnel aspects of the work. Using "wind tunnel" as a negative term might initially seem as a harmless following of the requester's suggestion, but would result in a "miss" of such a document.

Negation may be specified either via the logical operator "not" or via negative weight values.

3.2.5.1 Negation in Logical Equation ("Not" operator). Assume the query "Shells," "Shell Theory" and "Shell Stability," but exclude references on "Cylindrical Shells." The coding for this problem is shown in Fig. 35. The negative sign (-) in front of the parenthetical expression (D + E) acts as a negative operator on both D and E.

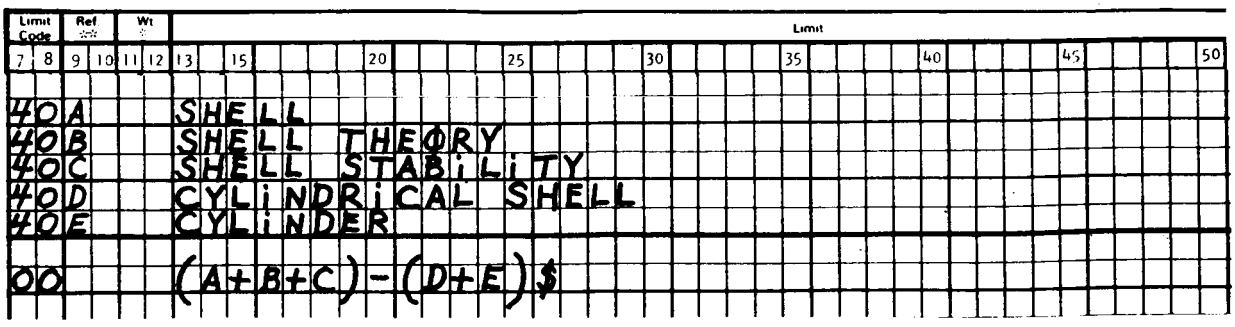


Fig. 35: Negation in Logical Equation ("Not" operator)

3.2.5.2 Negative Weights. Using the previous example, the negative weight technique is shown in Fig. 36. "Cylindrical Shell" and "Cylinder" are each assigned a weight of -3, which is coded by placing a minus (-) sign over the digits in column 12. The minus sign is keypunched by using an overpunch (11 punch). "Shell," "Shell Theory," and "Shell Stability" are each assigned a weight of 1. The weight limit is set at 1.

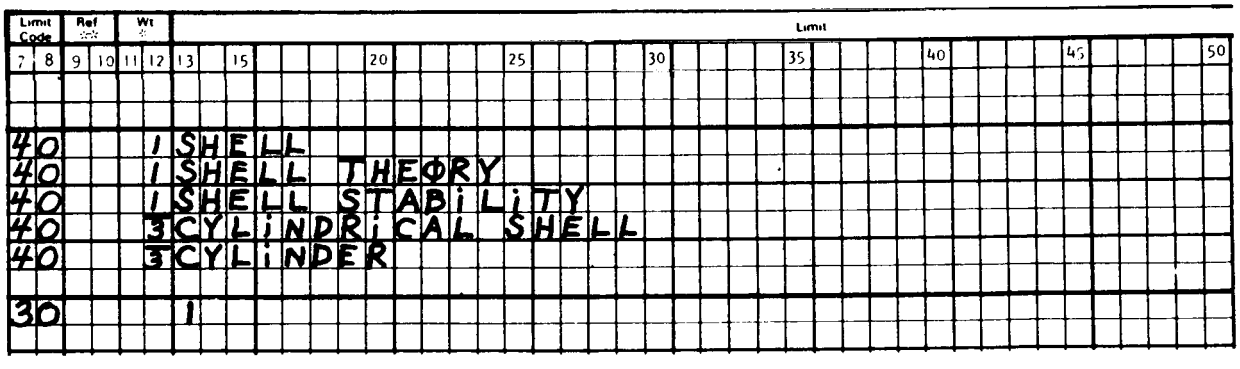


Fig. 36: Negative Weights (Single Terms)

It is clear that documents indexed under either of the negative weight terms could not develop a weight higher than 0, therefore, they would not be "hits."

Negative weights may also be used within the Group Weight System. Most of these situations are restricted to very specialized and "tailored" SDI applications. An example is shown in Fig. 37 for the query: "Laser" research, but exclude reports under Contract AF 04(695)-269 and "Attitude Control," but exclude reports from MIT, Cambridge.

3.2.5.3 Negation of Non-Subject Terms. The previous example illustrates the negation of non-subject search elements such as Contract Number and Corporate Source. Personal Authors, Report Numbers, and other limits may also be treated in this way. In each case the non-subject term should be used with the appropriate Limit Code, as specified in its section.

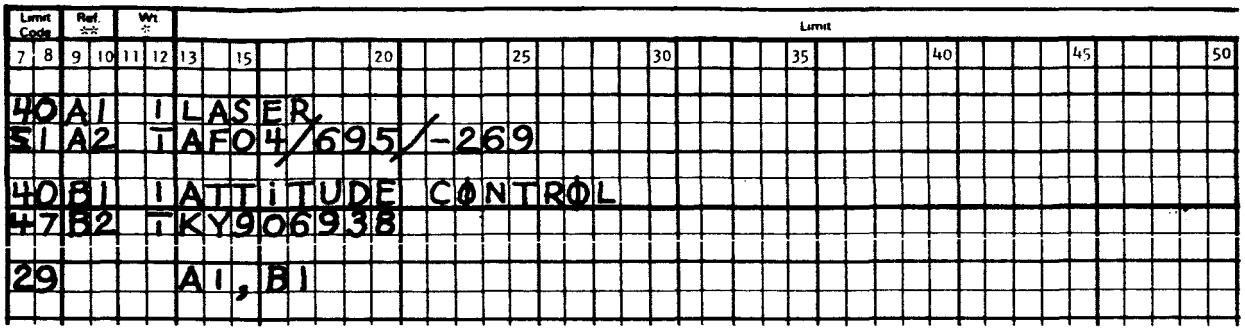


Fig. 37: Negative Weights (Groups)

3.2.6 Root Searching

Root searching has already been described in the sections on Contract Number, Report Number, and Personal Author searching, the three areas to which it can be applied in this system. The coding details can be found in those sections. It is, however, a technique worthy of special mention.

Essentially it permits one to search on leading sequences of characters in any one of the three fields mentioned. Numerous situations arise, in the course of information retrieval work, in which the technique has practical application.

For instance, within the NASA Contract Numbering scheme it is known that Marshall Space Flight Center generally has cognizance over all contracts with the "NAS8" prefix (See Appendix E). It is possible to use the prefix itself as a search term. Marshall has certain assigned areas of technological responsibility within the total NASA program and it is nearly possible, in this way, to restrict a search to a program area. Searches of this type can approximate the products of purely management information systems.

In the Personal Author area, it may well be that a searcher is uncertain of the initials of the author in question. Is it D. Kummer, D. L. Kummer, or D. H. Kummer? A search on the root Kummer avoids this problem, though it may, of course, introduce some small amount of extraneous material.

In the Report Number area it is well known that the report series of certain organizations almost constitute a "Brand Name" type of product. In the field of translations, for instance, the report number prefixes NASA-TT-F-, FTD-, and RSIC-, would immediately be recognized by the most special librarians and could be put to practical use in a search restricted to foreign research.

In each case the size of the "root" is unrestricted. It may be one character or many. For instance, though the root utilized in the translation search above was NASA-TT-F-, the root used by the Facility in the year-end compilation of A Selected Listing of NASA Scientific and Technical Reports for 1965 is NASA-.

Root searching, is however, restricted to leading characters, characters which appear at the beginning of a term. It is, therefore, more limited in application than a "masking" scheme, such as that described in Reference 22, which searches a skein of characters (such as IODE or ORGAN) wherever they may appear, whether beginning,

middle, or end of a term. The additional capability will generally be of interest only to subject term searching, and not to non-subject term searching. It is, however, obviously a direction toward which the present system could evolve, as it seeks more flexibility and responsiveness.

3.2.7 Comment Card (Limit Code *)

This code may be used to write literally any comments which are applicable to the search and which should receive lots of exposure. The printout occurs on the lead sheet of each bibliography, the Problem Validation Sheet (Fig. 39). The asterisk (*) is placed in column 7. Column 8 is used for sequencing comment cards. The comments are written in columns 13 - 62 (Fig. 38). Any number of comment cards may be used.

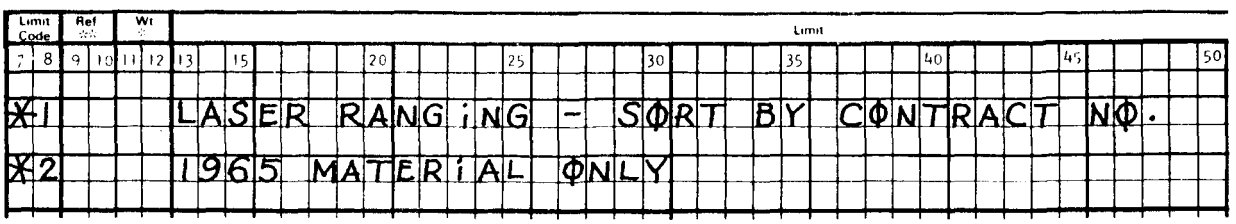


Fig. 38: Limit Code *—Comment Card

3.2.8 Validation of Question

A special page entitled "Validation Listing" (Fig. 39), will be printed for each problem in a search batch prior to the actual searching activity.

It contains the total keypunch input from the Form 732 Worksheet, and it is identical with it except for the designation "DELETED" which appears after those limits which were found to be in error. If an error exists in the coding, either because of a non-existent Limit Code or missing elements in the equation or weight specifications, the word "DELETED" prints opposite the offending line of data followed by a code. Table 6 contains the codes and types of errors.

Table 6. Validation Listing: Error Codes and Their Meanings

Error Code	Error Message
01:	1st character of the Problem No. is blank
02:	Equation incomplete
03:	Input Limit Code incorrect
04:	Data in wrong columns
05:	Weighted limit has no group identification
06:	Weighted limit identification not given weight requirement
08:	Second hit print maximum card for problem
09:	Second print option card for problem
10:	Illegal print option
11:	Second sort option card for problem
12:	Illegal sort option

Table 6 (Con't.)

Error Code	Error Message
13:	Second Limit Code 30 (Single Term Weight) Card
14:	Weighted group not given a weight requirement
15:	Last weight group not given weight requirement
16:	Weight group card is blank
17:	Weight group identification is given as "0"
18:	No separator between two weight groups
19:	Two groups have been given the same identification
20:	Column 13 is blank
21:	Data field wrong length
22:	Input range is missing the separating dash
23:	1st equation card missing
37:	Equation format error A. following a term reference B. following an open paren C. following an operator blank, following a close paren
40:	Too many open parens
41:	Too many close parens

In the previous system the validation phase went on to indicate "Problem Not Accepted for Searching" for each problem that contained errors. Invalid problems were not formatted for searching and therefore had to be completely re-submitted before they could be run. The present system provides the analyst with an option in this situation. Problems containing errors are formatted for the search process along with the valid problems; however, the faulty data lines are eliminated. In this way the analyst has the option of going ahead with the batch of problems without delay if the errors prove to be minor ones that would not substantially affect output. This proves to be a useful option in many operating environments in which the searches are left to be run at night or during some period when an analyst is not at hand. In such an environment the validation and search for all problems can be run without stopping. The errors are brought to the attention of the analyst the next day and he then judges the necessity of any re-runs for those problems that had errors.

If a really large number of errors exist or they are major, it may, of course, be desirable to correct the input and repeat the entire validation phase before starting the actual search.

The Logical Equation prints out in accordance with the special keypunch instruction on the lower right corner of the Form 732:

Left parenthesis	(= %	0-4-8 Punch
Right parenthesis	) = □	12-4-8 Punch
"or"	+ = &	12 Punch

VALIDATION LISTING

012306*1	LIDAR IS AN ACRONYM FOR LIGHT DETECTING AND	
012306*2	RANGING - LASER RANGING MORE PRECISE THAN RADAR	
012306*3	RANGING	
01230613	A,N	
01230629	A7,B1	
01230631	SER	
01230632	ACC,CIT,TER,WEI	
01230640A5	1DISTANCE MEASURING EQUIPMENT	7
01230640A1	6LASER	325
01230640A2	1RANGE	335
01230640A4	1RANGEFINDER	3
01230640A7	1RANGEFINDING	2
01230640A3	1RANGING	7
01230640A6	1TRACKING	326
01230640B1	1LIDAR	
01230640B2	1OPTICAL RADAR	8
01230640B3	1OPTICAL RANGEFINDER	2

Problem without ERROR

VALIDATION LISTING

012306*1	LIDAR IS AN ACRONYM FOR LIGHT DETECTING AND	
012306*2	RANGING - LASER RANGING MORE PRECISE THAN RADAR	
012306*3	RANGING	
01230613	A,N	
01230629	A7,B1	
01230631	SER	
01230632	ACC,CIT,TER,WEI	
01230640A1	6 LASER DELETED- 04	
01230640A5	1DISTANCE MEASURING EQUIPMENT	7
01230640A2	1RANGE	335
01230640A4	1RANGEFINDER	3
01230640A7	1RANGEFINDING	2
01230640A3	1RANGING	7
01230640A6	1TRACKING	326
01230640B1	1LIDAR	
01230640B2	1OPTICAL RADAR	8
01230640B3	1OPTICAL RANGEFINDER	2

Problem with ERROR

Fig. 39: Problem Validation Sheet

3.3 ANALYSIS

3.3.1 Pre-Search Analysis: Vocabularies

From a study of the request, the search analyst must develop a list of relevant search terms. The difficulty in compiling the list will vary with the complexity of the subject of the search. The list can be developed by judicious use of NASA-SP-7016, Guide to the Subject Indexes for STAR, STAR cumulative indexes themselves, and reference works such as scientific encyclopedias, scientific dictionaries, and specialized texts and handbooks. Regardless of their source, however, the search terms must appear in the current Vocabularies or Authority Lists issued by the Facility. These are:

(1) Corporate Source Authority List

(2) Contract Number List

(3) Personal Author List (Not currently being issued)

(4) Subject Authority List (Contains posting statistics, by series)

Sample pages of each vocabulary can be seen in Fig. 40.

Telephone or personal contact with the requester will often result in some clarification of the request. Such contact will assist in problem formulation and in the edit of the initial search, in particular, the degree of specificity or generality desired may be determined after a conversation with the requester.

Discussion with an authority on the subject matter should be reserved for particularly difficult subjects and only when leads from reference works and technical reports or their abstracts are unavailing, and the requester cannot be contacted.

The analyst is encouraged to be on the alert to use Limit Codes whenever the request permits. Generous use of Limit Codes in conjunction with search terms will significantly reduce the search and print time.

The maximum number of hits possible for each problem should be computed by the analyst; and probable number of hits should be estimated. If the output seems likely to be excessive, additional restrictions should be imposed, e.g., by tightening the logic, by searching on published terms only, by the weighting technique, or by any of the various Limit Codes.

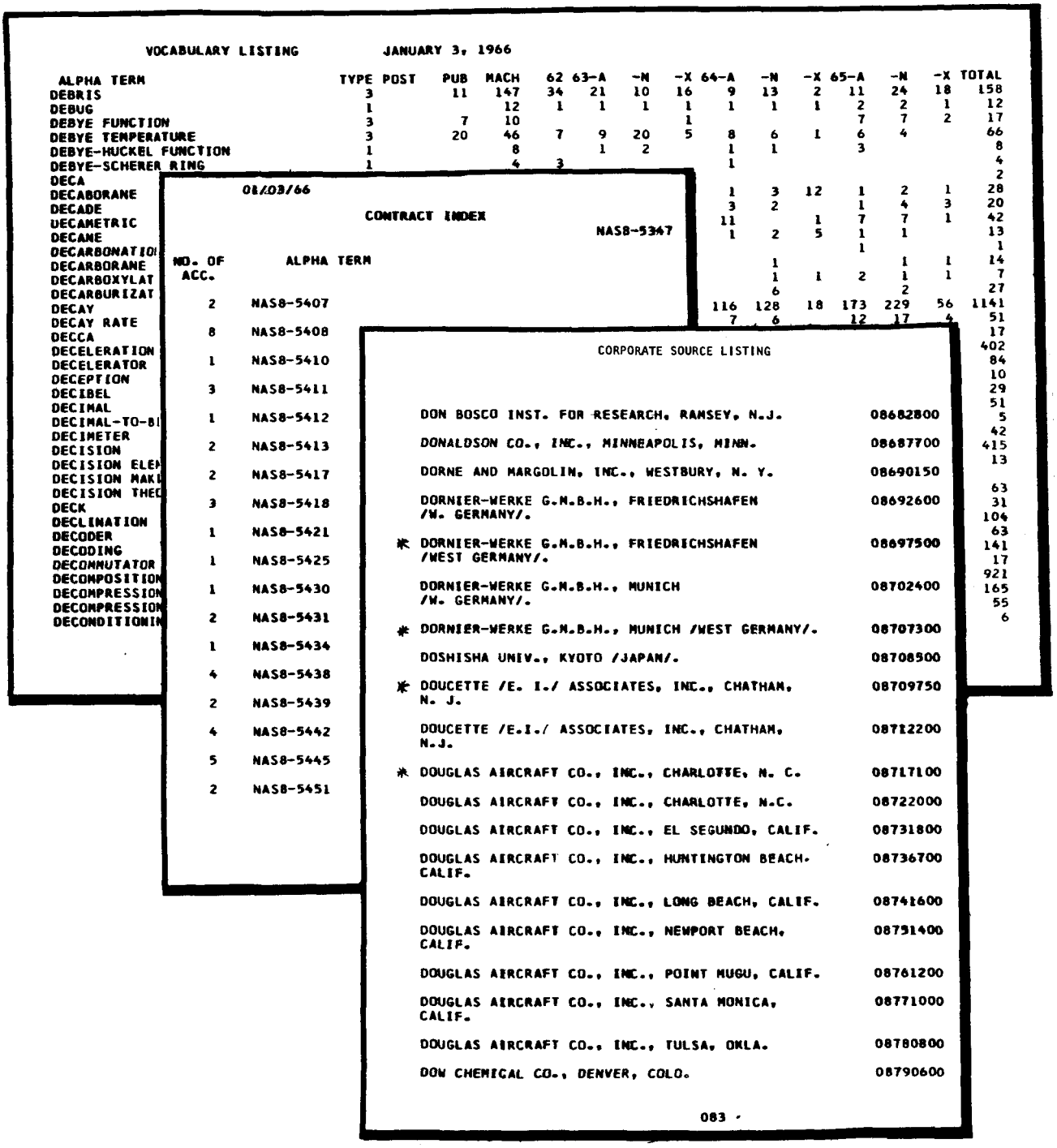
Searches may be categorized as follows:

a. Loose - high output and irrelevant material expected.

b. Moderately loose - some irrelevant material expected.

c. Moderately tight - some irrelevant material expected, but less than b.

d. Tight - no irrelevant material expected.



VOCABULARY LISTING JANUARY 3, 1966

ALPHA TERM	TYPE	POST	PUB	MACH	62	63-A	-N	-X	64-A	-N	-X	65-A	-N	-X	TOTAL
DEBRIS	3		11	147	34	21	10	16	9	13	2	11	24	18	158
DEBUG	1			12	1	1	1	1	1	1	1	2	2	1	12
DEBYE FUNCTION	3		7	10				1				7	7	2	17
DEBYE TEMPERATURE	3		20	46	7	9	20	5	8	6	1	6	4		66
DEBYE-HUCKEL FUNCTION	1			8		1	2		1	1		3			8
DEBYE-SCHERER RING	1			4	3				1						4
DECA															2
DECABORANE									1	3	12	1	2	1	28
DECADE									3	2		1	4	3	20
DECAMETRIC									11		1	7	7	1	42
DECANE									1	2	5	1	1		13
DECARBONATIO												1			1
DECARBORANE										1			1	1	14
DECARBOXYLAT										1	1	2	1	1	7
DECARBURIZAT										6			2		27
DECAY									116	128	18	173	229	56	1141
DECAY RATE									7	6		12	17	4	51
DECCA															17
DECELERATION															402
DECELERATOR															84
DECEPTION															10
DECIBEL															29
DECIMAL															51
DECIMAL-TO-BI															5
DECIMETER															42
DECISION															415
DECISION ELE															13
DECISION MAK															
DECISION THE															63
DECK															31
DECLINATION															104
DECODER															63
DECODING															141
DECOMMUTATOR															17
DECOMPOSITION															921
DECOMPRESSION															165
DECOMPRESSION															55
DECONDITIONIN															6

08/03/66

CONTRACT INDEX

NAS8-5347

NO. OF ACC.	ALPHA TERM
2	NAS8-5407
8	NAS8-5408
1	NAS8-5410
3	NAS8-5411
1	NAS8-5412
2	NAS8-5413
2	NAS8-5417
3	NAS8-5418
1	NAS8-5421
1	NAS8-5425
1	NAS8-5430
2	NAS8-5431
1	NAS8-5434
4	NAS8-5438
2	NAS8-5439
4	NAS8-5442
5	NAS8-5445
2	NAS8-5451

CORPORATE SOURCE LISTING

	DON BOSCO INST. FOR RESEARCH, RAMSEY, N.J.	08682800
	DONALDSON CO., INC., MINNEAPOLIS, MINN.	08687700
	DORNE AND MARGOLIN, INC., WESTBURY, N. Y.	08690150
	DORNIER-WERKE G.M.B.H., FRIEDRICHSHAFEN /W. GERMANY/.	08692600
*	DORNIER-WERKE G.M.B.H., FRIEDRICHSHAFEN /WEST GERMANY/.	08697500
	DORNIER-WERKE G.M.B.H., MUNICH /W. GERMANY/.	08702400
*	DORNIER-WERKE G.M.B.H., MUNICH /WEST GERMANY/.	08707300
	DOSHISHA UNIV., KYOTO /JAPAN/.	08708500
*	DOUCETTE /E. I./ ASSOCIATES, INC., CHATHAM, N. J.	08709750
	DOUCETTE /E.I./ ASSOCIATES, INC., CHATHAM, N.J.	08712200
*	DOUGLAS AIRCRAFT CO., INC., CHARLOTTE, N. C.	08717100
	DOUGLAS AIRCRAFT CO., INC., CHARLOTTE, N.C.	08722000
	DOUGLAS AIRCRAFT CO., INC., EL SEGUNDO, CALIF.	08731800
	DOUGLAS AIRCRAFT CO., INC., HUNTINGTON BEACH, CALIF.	08736700
	DOUGLAS AIRCRAFT CO., INC., LONG BEACH, CALIF.	08741600
	DOUGLAS AIRCRAFT CO., INC., NEWPORT BEACH, CALIF.	08751400
	DOUGLAS AIRCRAFT CO., INC., POINT MUGU, CALIF.	08761200
	DOUGLAS AIRCRAFT CO., INC., SANTA MONICA, CALIF.	08771000
	DOUGLAS AIRCRAFT CO., INC., TULSA, OKLA.	08780800
	DOW CHEMICAL CO., DENVER, COLO.	08790600

083

Fig. 40: Sample Vocabulary Pages

For example, in making a search on the Physiological Aspects of Weightlessness of Man in Space Flight, an equation,

L = Weightlessness

would be classified as loose, because documents pertaining to weightlessness of cryogenic fluids, propellants, etc., would be included in the search results.

If the same equation were used with Limit Code 16, Journal Announcement Category, for Categories 04 and 05 (Biosciences and Biotechnology), the equation would be classified as "tight."

The analyst must gauge the request very carefully in order to decide which type of equation is best called for. Experience with the effect of both search limits and restrictions is needed.

A few examples of sample search statements are contained in Section 3.4.

3.3.2 Post-Search Analysis (NASA Search System Analysis Sheet—Facility Form 637)

During the first year and a half of operation it was customary to deliver to the Manager of the Reference Department for final approval and release the following: (1) one copy of the original requesting letter or memorandum; (2) one copy of the analyst's worksheet, showing terms used, the number of postings against each term, and the logical equation specified; (3) the finished search itself, a machine print-out of bibliographic citations. Upon approval, the search itself (#3) was transmitted with a covering letter and the other documentation was returned to the files.

With experience, however, the analysts became increasingly sophisticated in developing search strategies and in analyzing their results. Analysts deliberately "cast their net" over greater or lesser areas, depending on the stated or implied desires of the requesters to receive comprehensive searches or to receive only the most important references, dealing exclusively with the subject in question. As a result of reject analysis, feedback to the indexers became a regular feature of daily operations. This took the form of recommendations for new terms to be added to the vocabulary, recommendations that existing accessions be re-indexed to certain terms that were not used in the first indexing, recommendations for the deletion of existing terms and/or the transfer of existing postings, suggestions for the proper use of existing terms, and notifications of faulty postings that existed due either to keypunch error, machine error, human error, or improper indexing, and which should be removed.

For these reasons, and for other administrative reasons, it became necessary to devise a paperwork instrument by which to formally communicate such recommendations to the Processing Department of the Facility. It was also necessary that management or supervision approving the final search product be provided with additional information on which to base their approval both of the product and of the work of the analyst. It was also thought that such an instrument could profitably be utilized to gather a few statistics that otherwise were widely dispersed on the files.

The "NASA Search System Analysis Sheet," Fig. 41, was designed and put into use to serve the above functions. This prototype form is serving its purpose at the Facility and the general consensus is that an examination of these forms provides a real "feel" for how the machine searching activity is going as a whole, and how individual analysts are progressing in particular. The form is not only passed between Departments but between analyst and analyst, analyst and indexer, and is much used as an instructional device for new employees.

ANALYSIS SHEET - NASA Linear File Search System ANALYST TYLER Date 5-6-66

Bib. No. 2425 Title: ULTRAVIOLET DETECTOR

NOC (for SWIFT Index) " "

A. Man-Machine Data

a. Analyst: pre-search analysis 1.5 hrs; edit 0.8 hrs. -total 2.3 hrs.
b. Administrative effort (scope sheet, ltr of X-mittal, assbly, etc.) -total .5 hrs.
c. Computer: initial search .6 hrs; final .3 hrs. (prorated) -total .9 hrs.
d. Elapsed working days (receipt to mailing) 8

B. Terms/Hits

a. Total Search Terms 17
b. Max Hits Possible 1869
c. Anticipated Hits 175

C. Most Heavily Posted Terms - Postings

1. DETECTION 2864
2. DETECTOR 2654
3. MEASUREMENT 13895
4. ULTRAVIOLET 1869
5. SENSOR 1671

D. Limits Used (Series, Acc. Ranges, Contr. No., Corp. Source, etc.)

PUBLISHED TERM/MACHINE TERM INTERSECT; WEIGHT GROUP LIMIT; A, N ONLY

E. Type Equation

__a. Loose. High output. Irrelevant material expected.
__b. Moderately loose. Some irrelevant material.
✓c. Moderately tight. Very little irrelevant material.
__d. Tight. No irrelevant material.
__e. Very tight. Weighting used to reduce output.

F. Initial Search Results

a. Hits (Total output = T) 151
b. Accepted Hits after edit (Accepted Hits = A) 134
c. Acceptance Ratio, A/T x 100 89%

G. Auxiliary Search Results (Machine)

a. Hits (T') _____
b. Accepted Hits (A') _____

H. Reject Analysis

a. Total Rejects on Initial Search..... 17
b. Rejects due to type of equation, i.e., out-of-scope or marginal..... 17
c. Rejects classified as False Drops or "noise" (indexing, machine, keypunch, or operational errors). —
d. Total Rejects considered:
Excessively High____ High____ Average ✓ Low____

I. Miss Analysis

a. Misses detected, overall ____
b. How detected? _____

J. Analyst's Comments (Include search strategy, reject analysis, weighting, indexing errors, vocabulary changes, etc.)

SPECTROMETRY ASPECTS NECESSARY FOR MAX COVERAGE; HOWEVER, CARE NEEDED TO AVOID FILE DUMP ON SUBJECT OF ULTRAVIOLET SPECTROMETRY

FFNo 637 May 65

Fig. 41: NASA Search System Analysis Sheet (Facility Form 637)

3.3.3 Edited Final Printout

An IBM card is automatically produced for each accession number retrieved in a given search. This deck of cards may be used, after editing, to return to the computer for a final printout of just those accessions judged fully relevant to the original question. Rather than return to the entire file for the final printout, it is advantageous to return to the "hit tape" that was generated by the relevant problem batch.

Fig. 42, and accompanying notes, indicate the layout of such a card.

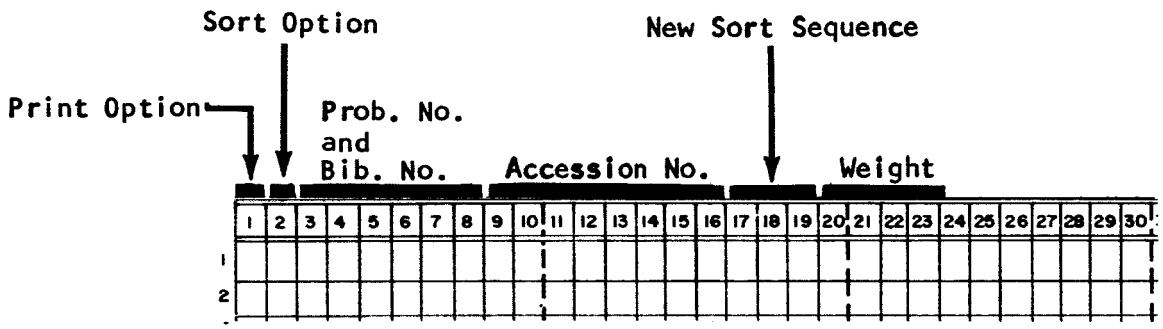


Fig. 42: Hit Card for Use as Input for Final Printouts

Column 1: Print Option, as specified on Worksheet

1 = ACCESSION NO. ONLY	A = + WEIGHT
2 = ACC + CIT	B = + WEIGHT
3 = ACC + CIT + NOC	C = + WEIGHT
4 = ACC + CIT + TER	D = + WEIGHT
5 = ACC + CIT + NOC + TER	E = + WEIGHT
6 = ACC + NOC + TER	F = + WEIGHT
7 = ACC + NOC	G = + WEIGHT
8 = ACC + TER	H = + WEIGHT

Column 2: Sort Option, as specified on Worksheet

1 = ACCESSION NO. ONLY
2 = WEIGHT + ACCESSION NO.
3 = CORPORATE SOURCE + ACCESSION NO.
4 = CONTRACT NO. + ACCESSION NO.
5 = REPORT NO. + ACCESSION NO.
6 = CATEGORY + ACCESSION NO.
7 = ACCESSION TYPE + ACCESSION NO.
8 = PERSONAL AUTHOR + ACCESSION NO.
9 = COSATI SUBJECT CATEGORY + ACCESSION NO.

Columns 3 - 8: Problem Number and Bibliography Number, as specified on Worksheet.

Columns 9 - 16: Accession Number of Hit (e.g., 65N12345).

Columns 17 - 19: Reserved for insertion of desired output sequence, if different from available sorting options.

Columns 20 - 23: Weight of this accession number.

Columns 17 - 19 are reserved for changing the sort option from that originally specified. For example, the deck of selected items may be sequenced manually by any desired criteria. The deck is then serial gang-punched in columns 17 - 19 (001, 002, 003, etc.). These punches over-ride the previous sort option (column 2). After gang-punching, the cards are sorted into accession number order, either manually or by EAM equipment, and placed into the computer in this order. The final printout then appears in the same sequence as the cards were gang-punched.

During this operation the previous print option remains valid. A new print option would require a new card with the new option specified in column 1.

3.4 SAMPLE SEARCHES

Twenty-six sample searches are given for analyst training. Figures 43A/B through 49A/B contain pairs of problems coded by equations and weights, respectively. The remainder contains a diverse group portraying the use of negative weights, non-subject limits, and a special problem (Fig. 59) in which a subject term is intersected with a corporate source, a contract number, or personal author.

Part 3—Retrieval: Sample Searches

For convenience, the list of illustrations for the sample problems are repeated below.

Figure	Title	Page
43A	PERT Project - Equation	66
43B	PERT Project - Single Term Weights	67
44A	Laser Ranging - Equation	68
44B	Laser Ranging - Group Weights	69
45A	Vacuum Ultraviolet - Equation	70
45B	Vacuum Ultraviolet - Group Weights	71
46A	Sonic Boom - Equation	72
46B	Sonic Boom - Group Weights	73
47A	Holography - Equation	74
47B	Holography - Group Weights	75
48A	Laser Communications - Equation	76
48B	Laser Communications - Group Weights	77
49A	Thrust Vector Control - Equation	78
49B	Thrust Vector Control - Group Weights	79
50	Radiation Effects - Negative Weights	80
51	Selected Accession Ranges	81
52	COSATI Categories	82
53	Weightlessness - Group Weights	83
54	Corporate Source	84
55	Contract Numbers	85
56	Contract Number Root	86
57	Personal Author	87
58	Multiple Authors	88
59	Combined Search - Group Weights	89
60	Report Number Root	90
61	Nuclear Propulsion - Document Type	91

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 01 Bibliography No. 1831

TITLE: PERT PROJECT ANALYST: CARLSON Date _____

Due Date _____ No. of Terms _____

Limit Code	Ref Art	Wt *	Limit	No. of Acc.	*
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
32			ACC,CIT,TER		
13			A,N,X		
31			SER		
40A			PERT PROJECT	81	
40B			CRITICAL PATH ANALYSIS	9	
00			A+B$		
*			PERT PROJECT FOR GRUMMAN - MAX HITS 90		

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 734 Jan 66

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH
INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

Fig. 43A: PERT Project - Equation

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 02 Bibliography No. 1831

TITLE: PERT PROJECT ANALYST: CARLSON Date _____

Due Date _____ No. of Terms _____

Limit Cards	Ref. **	Wt *	Limit	No. of Acc.

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH
INSTRUCTIONS

(= %--0-4-8 Punch
) = @--12-4-8 Punch
+ = &--12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 43B: PERT Project - Single Term Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 03 Bibliography No. 1706

TITLE: LASER RANGING ANALYST: ECKERT Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	‡
32			ACC,CIT,TER		
13			A,N,X		
31			SER		
40	A		LASER	2354	
40	B		OPTICAL RADAR	53	
40	C		RANGE	2815	
40	D		RANGEFINDER	27	
40	E		RANGEFINDING	21	
40	F		RANGING	59	
40	G		TRACKING	3200	
40	H		DISTANCE MEASURING EQUIPMENT	60	
00			(A+B)·(C+D+E+F+G+H)$		
*1			THE TERM LIDAR, ACRONYM FOR LIGHT DETECTING AND		
*2			RANGING, IS BEING ADDED TO VOCABULARY		
*3			MAX HITS 2407		

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 73¼ Jan 66

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH
INSTRUCTIONS

(= %---0-4-8 Punch
) = @--12-4-8 Punch
+ = &--12 Punch

Fig. 44A: Laser Ranging - Equation

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 02 Bibliography No. 1706

TITLE: LASER RANGING ANALYST: ECKERT Date _____

Due Date _____ No. of Terms _____

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	$
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
32			ACC,CIT,TER,WEI		
13			A,N,X		
31			SER		
40	A1	6	LASER	2354	
40	A2	1	RANGE	2815	
40	A3	1	RANGEFINDER	27	
40	A4	1	RANGEFINDING	21	
40	A5	1	RANGING	59	
40	A6	1	DISTANCE MEASURING EQUIPMENT	60	
40	A7	1	TRACKING	3200	
40	B1	1	LIDAR	17	
40	B2	1	OPTICAL RADAR	53	
40	B3	1	OPTICAL RANGEFINDER	23	
29			A7,B1		
*1			LIDAR IS AN ACRONYM FOR LIGHT DETECTING AND		
*2			RANGING - LASER RANGING IS MORE PRECISE THAN		
*3			RADAR RANGING		

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

Fig. 44B: Laser Ranging - Group Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 04 Bibliography No. 1801

TITLE: VACUUM ULTRAVIOLET ANALYST: CARLSON Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	‡
32			ACC,CIT,TER,NΦC		
10			1		
13			A,N,X		
31			WEi		
40	A	6	VACUUM ULTRAViΦLET	93	
40	B	1	ULTRAViΦLET	1596	
40	C	1	ULTRAViΦLET RADiATiΦN	322	
40	D	1	VACUUM	2900	
40	F	1	VACUUM CHAMBER	77	
40	E	1	VACUUM EFFECT	74	
00			A+(B+C)-(D+E+F)$		
30			2		
*1			DΦCS iNDEXED BY VACUUM ULTRAViΦLET WiLL BE AT		
*2			TΦP ΦF LiST BECAUSE ΦF WEiGHT 6 AND SΦRT BY		
*3			WEiGHT		
*4			MAX HiTS 20;1 - UNCLASSiFiED DΦCS ΦNLY		
*5			EQUATiΦNS WiTH WEiGHTS iNCREASE SEARCHiNG SPEED		

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH
INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 45A: Vacuum Ultraviolet - Equation

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 05 Bibliography No. 1801

TITLE: VACUUM U. V. ANALYST: CARLSON Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	$
32			ACC,CIT,TER,NOC		
10			1		
13			A,N,X		
31			WEI		
40	A1	10	VACUUM ULTRAVIOLET	93	
40	B1	3	ULTRAVIOLET	15961	
40	B2	1	VACUUM	29000	
40	B3	1	VACUUM CHAMBER	77	
40	B4	1	VACUUM EFFECT	74	
40	C1	3	ULTRAVIOLET RADIATION	32	
40	C2	1	VACUUM	29000	
40	C3	1	VACUUM CHAMBER	77	
40	C4	1	VACUUM EFFECT	74	
29			A10,B4,C4		
*1			DOCS INDEXED BY VACUUM ULTRAVIOLET WILL BE AT		
*2			TOP OF LIST BECAUSE OF WEIGHT 10 AND SORT BY		
*3			WEIGHT		
*4			MAX HITS 2011 - UNCLASSIFIED DOCS ONLY		

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 45B: Vacuum Ultraviolet - Group Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 06 Bibliography No. 1710

TITLE: SONIC BOOM ANALYST: USDANE Date

Due Date No. of Terms

Limit Code	Ref. **	Wt *	Limit	No. of Acc.	‡
32			ACC,CIT,TER		
31			SER		
12			63X80001-63X99999,64X80001-64X99999		
12			65X80001-65X99999,66X80001-66X99999		
40	A		SONIC BOOM	125	P
40	B		SOUND BARRIER	0	P
40	C		SOUND	1407	P
40	D		BARRIER	253	
40	E		SONIC	843	
40	F		BOOM	198	
40	G		BANG	23	
40	H		SHOCK WAVE	852	P
00			A+B+C·D+E·(F+G+H)$		
*			X80 AND 90K EXCLUDED - MAX HITS 1221		

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH
INSTRUCTIONS

(= %---0-4-8 Punch
) = @--12-4-8 Punch
+ = &--12 Punch

Fig. 46A: Sonic Boom - Equation

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 07 Bibliography No. 1710

TITLE: SONIC BOOM ANALYST: USDANE Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	+
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
32			ACC,CIT,TER		
12			63X80001-63X99999,64X80001-64X99999		
12			65X80001-65X99999,66X80001-66X99999		
31			SER		
40	A1		ISONIC BOOM	1250	
40	A2		ISOUND BARRIER	1404	
40	B1		ISOUND	2533	
40	B2		IBARRIER	8433	
40	C1		3SONIC	1988	
40	C2		IBOOM	2233	
40	C3		IBANG	8532	
40	C4		ISHOCK WAVE		
29			A1,B2,C4		
*1			X80 AND 90K EXCLUDED - MAX HITS 1221		
*2			GROUP WEIGHTING TECHNIQUE BECOMES EASY AFTER		
*3			PRACTICE		

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 73z Jan 66

Fig. 46B: Sonic Boom - Group Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 08 Bibliography No. 1956

TITLE: HOLOGRAPHY ANALYST: USDANE Date

Due Date No. of Terms

Limit Code	Ref **	Wt *	Limit	No. of Acc.
32			ACC,CIT,TER	
31			SER	
40	A	20	WAVE FRONT RECONSTRUCTION	16
40	B	10	HOLOGRAPHY	6
40	C	1	LASER OUTPUT	623
40	D	1	LASER	930
40	E	1	PHOTOGRAPHY	1924
40	F	1	DIMENSION	48
40	G	1	DIMENSIONAL	2248
40	H	1	WAVE	12985
40	I	1	FRONT	552
40	J	1	RECONSTRUCTION	42
00			A+B+(C+D·E)·(F+G)+H·I·J$	
30			3	
*			HOLOGRAPHY ADDED TO VOCAB DEC 65	

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH INSTRUCTIONS

(= %--0-4-8 Punch
) = @--12-4-8 Punch
+ = &--12 Punch

Fig. 47A: Holography - Equation

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 09 Bibliography No. 1956

TITLE: HOLOGRAPHY ANALYST: USDANE Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	↓
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
32			ACC,CIT,TER		
31			SER		
40	A1		1WAVE FRONT RECONSTRUCTION	16	
40	A2		1HOLOGRAPHY	0	
40	B1		2LASER OUTPUT	623	
40	B2		1DIMENSION	48	
40	B3		1DIMENSIONAL	2248	
40	C1		4LASER	930	
40	C2		2PHOTOGRAPHY	1924	
40	C3		1DIMENSION	48	
40	C4		1DIMENSIONAL	2248	
40	D1		1WAVE	12985	
40	D2		1FRONT	532	
40	D3		1RECONSTRUCTION	42	
29			A1,B3,C7,D3		
*1			A HIT ON ANY GROUP IS A HIT FOR THE DOCUMENT		
*2			HOLOGRAPHY ADDED TO VOCAB DEC 65		

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FPNo 73% Jan 66

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

Fig. 47B: Holography - Group Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 10 Bibliography No. 1871

TITLE LASER COMMUNICATIONS ANALYST: TYLER Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.
32			ACC,CIT,TER	
12			64X35001-64X39999,65X35001-65X39999	
13			A,N,X	
31			SER	
40	A		LASER	865
40	B		LASER MODE	100
40	C		LASER OUTPUT	547
40	D		PULSED LASER	91
40	E		COMMUNICATION	3827
40	F		SYSTEM	469
40	G		THEORY	53
40	H		S	339
40	I		COMMUNICATIONS DEVICE	54
40	J		LIGHT COMMUNICATION DEVICE	41
00			(A+B+C+D)•(E+F+G+H+I)+J$	
30			2	

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is useable only for terms.
** Ref. (col. 9-10) is useable only for terms.

FFNo 732 Jan 66

Fig. 48A: Laser Communications - Equation

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 11 Bibliography No. 1871

TITLE LASER COMMUNICATIONS ANALYST: TYLER Date

Due Date No. of Terms

Limit Code (7-8)	Ref. ** (9-10)	Wt. * (11-12)	Limit (13-62)	No. of Acc. (68-72)	ϕ (80)
32			ACC,CIT,TER,NOC		
12			64X35001-64X39999,65X35001-65X39999		
13			A,N,X		
31			SER		
40	A1	5	LASER	865	P
	2	1	COMMUNICATION	3827	
	3	1	S	339	
	4	1	SYSTEM	469	
	5	1	THEORY	53	
	A6	1	COMMUNICATIONS DEVICE	54	
	B1	5	LASER MODE	100	
	2	1	COMMUNICATION		
	3	1	S		
	4	1	SYSTEM		
	5	1	THEORY		
	B6	1	COMMUNICATIONS DEVICE		
	C1	5	LASER OUTPUT	597	
	2	1	COMMUNICATION		
	3	1	S		
	4	1	SYSTEM		
	5	1	THEORY		
	C6	1	COMMUNICATIONS DEVICE		
	D1	5	PULSED LASER	91	
	2	1	COMMUNICATION		
	3	1	S		
	4	1	SYSTEM		
	5	1	THEORY		
	D6	1	COMMUNICATIONS DEVICE		
40	E1	1	LIGHT COMMUNICATION DEVICE	41	
25					
29			A6,B6,C6,D6,E1		
*1			MAX HITS - 865+100+597+91+41 OR 1694		
*2			NO FOREIGN LANGUAGE DOCS		

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @--12-4-8 Punch
+ = &--12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 48B: Laser Communications - Group Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 12 | Bibliography No. 1959

TITLE: THRUST VECTOR CONTROL ANALYST: NEELY Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	↓
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
32			ACC,CIT,IER,NØC		
13			A,N,X		
31			WEI		
40	A	50	THRUST VECTØR CØNTRØL	200	
	B	50	THRUST VECTØR CØNTRØL /TVC/	70	
	C	20	PLUG NØZZLE	20	
	D	20	GIMBALLED CØNTRØL	20	
	E	11	THRUST	200	
	F	1	VECTØR CØNTRØL	30	
	G	1	VECTØR	40	
	H	1	STEERING	30	
	I	1	DIRECTIØNAL CØNTRØL	40	
	J	1	NØZZLE	300	
	K	1	PLUG	150	
	L	1	CLUSTER	50	
40	M	1	GIMBAL	40	
00			A+B+C+D+E·(F+G+H+I)+J·(K+L+M)$		
30			2		
*1			THRUST VECTØR CØNTRØL - WEIGHT LIMIT CØDE 30		
*2			WITH EQUATION INCREASES SEARCH SPEED		

NOTE: * Weight (col. 11-12) is useble only for terms.
** Ref. (col. 9-10) is useble only for terms.

FFNo 732 Jan 66

LEGEND
CODE LIMIT

- 00 to 09 Logical Equation
- 10 Security (1-6)
- 11 Acc. Range (Pos)
- 12 Acc. Range (Neg)
- 13 Acc. Series (A,N,X)
- 14 Document Type (00-09)
- 15 COSATI Category
- 16 Subject Category
- 17 Corporate Source (Term No.)
- 21 Contract No. (Root)
- 22 Personal Author (Root)
- 23 Report No. (Root)
- 25 No Foreign Lang.
- 29 Group Weights
- 30 Weight
- 31 Sort Option
- 32 Output Option
- 33 Hit Limit
- 40 Terms
- * Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

Fig. 49A: Thrust Vector Control - Equation

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 13 Bibliography No. 1959

TITLE: THRUST VECTOR CONTROL ANALYST: NEELY Date

Due Date No. of Terms

Line Code	Ref. **	Wt. *	Limit	No. of Acc.	$
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
32			ACC,CIT,TIER,NOC		
13			A,N,X		
31			WEI		
40A1			0THRUST VECTOR CONTROL	20000	
40A2			0THRUST VECTOR CONTROL /TVC/	70000	
40A3			0PLUG NOZZLE	20000	
40A4			0GIMBALLED CONTROL	20000	
40B1			4THRUST	20000	
40B2			1VECTOR CONTROL	30000	
40B3			1VECTOR	90000	
40B4			1STEERING	30000	
40B5			1DIRECTIONAL CONTROL	40000	
40C1			3NOZZLE	30000	
40C2			1PLUG	15000	
40C3			1CLUSTER	50000	
40C4			1GIMBAL	40000	
29			A10,B5,C4		
*1			THIS SEARCH IS PREFERRED TO PROBLEM 12		
*2			GROUP WEIGHTS ARE FASTER THAN EQUATIONS		

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

PFMo 73x Jan 66

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH INSTRUCTIONS

(= %--0-4-8 Punch
) = @--12-4-8 Punch
+ = &--12 Punch

Fig. 49B: Thrust Vector Control - Group Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 19 Bibliography No. 2501

TITLE: RADIATION EFFECTS ANALYST: NEELY Date _____

Due Date _____ No. of Terms _____

Limit Code	Ref **	Wt *	Limit	No. of Acc.	‡
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
32			ACC,CiT,TER		
11			65N10001-65N99999		
40	A1	1	RADiATiΦN EFFECT	25	3
40	A2	1	RADiATiΦN HAZARD	35	
40	A3	1	RADiATiΦN RESiSTANCE	45	
40	A4	3	MAN		
((	A5	3	HUMAN		
((	A6	3	ANiMAL		
((	A7	3	MAMMAL		
((	A8	3	PLANT /BiΦL/		
((	A9	3	BiΦLΦGY /GEN/		
11	AA	3	ΦRGANiSM		
40	AB	3	TiSSUE		
29			A1		
X1			ANY DΦCUMENT CΦNTAiNiNG ΦNE ΦR MΦRE ΦF NEGATiVE-		
X2			WEiGHT TERMS A4 THRΦUGH AB WiLL NΦT BE A HiT .		

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 734 Jan 66

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH
INSTRUCTIONS

(= %---0-4-8 Punch
) = @--12-4-8 Punch
+ = &--12 Punch

Fig. 50: Radiation Effects - Negative Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 15 Bibliography No. 2502

TITLE: SELECTED ACC RANGES ANALYST: CARLSON Date _____

Due Date _____ No. of Terms _____

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.
32			ACC,CIT,NOC,TER	
11			65N10001-65N10100,66N10001-66N10200	
*			SELECTED ACCESSION RANGES	

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 73z Jan 66

Fig. 51: Selected Accession Ranges

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 16 Bibliography No. 2502

TITLE: COSATI CATEGORIES ANALYST: TYLER Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	‡
32			ACC,CIT,TER		
11			65N10001-65N99999,66N10001-66N99999		
15			21C,21F		
*1			COSATI CATEGORY SEARCH OF STAR 65 AND 66 SERIES		
*2			ELECTRIC AND NUCLEAR PROPULSION		

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 52: COSATI Categories

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 17 Bibliography No. 2503

TITLE: PHYSIOLOGY AND WEIGHTLESSNESS ANALYST: NEELY Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	+
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
32			ACC,TER		
16			04,05		
11			65A10001-66X99999		
31			WEi		
33			0400		
40	A1	6	WEiGHTLESSNESS		
40	A2	4	ZERO GRAVITY		
40	B1	1	ZERO		
40	B2	1	GRAVITY		
29			A4,B2		
*	1		PHYSiOLOGiCAL ASPECTS OF WEiGHTLESSNESS		
*	2		NOTE CATEGORY LiMiTATiONS, 65 AND 66 COVERAGE,		
*	3		SORT BY WEiGHT, AND HiT LiMiT		

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH
INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

Fig. 53: Weightlessness - Group Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 8 Bibliography No. 2504

TITLE: AVCO CORP ANALYST: USDANE Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	#
32			ACC CIT		
31			COR		
11			65N1000I+65X34999		
17			A9353977,A940555I,A943I338,A9457I25,A9308699		
17			A96I847,A966342I,A97I4995,A9766569,A98I843		
17			A98697 7		
*1			CORPORATE SOURCE SEARCH - ALL AVCO CORP DOCS		
*2			ANNOUNCED IN STAR AND CSTAR IN 1965 - SORTED		
*3			BY CORP SOURCE /AVCO LAWRENCE BEFORE		
*4			AVCO NEW LONDON		

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @--12-4-8 Punch
+ = &--12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 54: Corporate Source

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 19 Bibliography No. 2505

TITLE: CONTRACT NUMBERS ANALYST: FLEEK Date

Due Date No. of Terms

Limit Code	Ref. **	Wt *	Limit	No. of Acc.	#
32			ACC,CIT,TER		
31			CON		
21			NAS8-5408$		
21			NAS8-5418$		
*			CONTRACT NUMBER SEARCH - SORT BY CONTRACT NUMBER		

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH
INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 55: Contract Numbers

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 20 Bibliography No. 2056

TITLE: CONTRACT NO. ROOT ANALYST: FLEEK Date _____

Due Date _____ No. of Terms _____

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	#
32			ACC,CIT		
31			CON		
11			65N10001-65N99999		
21			NAS1-		
*1			CONTRACT NUMBER ROOT SEARCH FOR LANGLEY -		
*2			N-SERIES 1965 - SORT BY CONTRACT NUMBER		

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos.)
12 Acc. Range (Neg.)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 56: Contract Number Root

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 21 Bibliography No. 2507

TITLE: AUTHOR SEARCH ANALYST: FLEEK Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.
22			ACC,CUT	
22			KUIPER, G. P.	
X1			SINGLE AUTHOR SEARCH - IF CODE 31 IS NOT USED.	
X2			SORT WILL BE BY ACCESSION NUMBER SEQUENCE.	

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 57: Personal Author

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 22 Bibliography No. 2508

TITLE: MULTIPLE AUTHORS ANALYST: FLEEK Date _____

Due Date _____ No. of Terms _____

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.	+
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
31			PER		
22			KUIPER, G. P.		
22			SHOEMAKER, E. M.		
*			MULTIPLE AUTHOR SEARCH - SORT BY AUTHOR		

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 58: Multiple Authors

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 24 Bibliography No. 2510

TITLE: COMBINED SEARCH (GROUP WEIGHTS) ANALYST: ECKERT Date

Due Date No. of Terms

Limit Code	Ref. **	Wt. *	Limit	No. of Acc.
32			ACC.CIT,TER	
31			SER	
40	A1		4LUNAR	
51	A2		1NAS7-100$	
52	A3		1KUIPER	
52	A4		1SHOEMAKER	
47	A5		1JJ574450	
40	B1		4MOON	
51	B2		1NAS7-100$	
52	B3		1KUIPER	
52	B4		1SHOEMAKER	
47	B5		1JJ574450	
29			A5.B5	
X1			SUBJECT TERMS INTERSECTED WITH CONTRACT NUMBER	
X2			OR AUTHOR OR CORPORATE SOURCE	
X3			KUIPER AND SHOEMAKER ARE LUNAR EXPERTS	
X4			NAS7-100 IS A JPL CONTRACT NUMBER	
X5			JJ574450 IS CORPORATE SOURCE CODE FOR JPL	
X6			COMBINED SEARCHES MUST USE GROUP WEIGHTS	

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 59: Combined Search - Group Weights

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model 11 System

Problem No. 25 Bibliography No. 2511

TITLE: REPORT No ROOT ANALYST: CARLSON Date

Due Date No. of Terms

Limit Cards	Ref. **	Wt. *	Limit	No. of Acc.	*
7 8	9 10	11 12	13 15 20 25 30 35 40 45 50 55 60 61 62	68 69 70 71 72	80
32			ACC,CIT,TER		
31			REP		
11			65N10001-65X99999		
23			RSIC-		
*1			REDSTONE SCIENTIFIC INFORMATION CENTER REPORT		
*2			NUMBER ROOT SEARCH - 1965 N- AND X-SERIES.		
*3			SORT BY REPORT NUMBER		

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 734 Jan 66

LEGEND
CODE LIMIT

00 to 09 Logical Equation
10 Security (1-6)
11 Acc. Range (Pos)
12 Acc. Range (Neg)
13 Acc. Series (A,N,X)
14 Document Type (00-09)
15 COSATI Category
16 Subject Category
17 Corporate Source (Term No.)
21 Contract No. (Root)
22 Personal Author (Root)
23 Report No. (Root)
25 No Foreign Lang.
29 Group Weights
30 Weight
31 Sort Option
32 Output Option
33 Hit Limit
40 Terms
* Comment Card

KEYPUNCH
INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

Fig. 60: Report Number Root

NASA LINEAR FILE SEARCH WORKSHEET
1410 Model II System

Problem No. 28 Bibliography No. 2612

TITLE: NUCLEAR PROPULSION ANALYST: CARLSON Date _____

Due Date _____ No. of Terms _____

Limit Code	Ref **	Wt *	Limit	No. of Acc.
32			ACC,CIT,TER	
11			65A10001-65X99999	
31			SER	
14			00,02,05,07	
40	A1		NUCLEAR PROPULSION	
40	B1		NUCLEAR	
40	B2		PROPULSION	
29			A1,B2	
*1			SEARCH FOR 1965 MATERIAL /NUCLEAR PROPULSION/	
*2			LIMITED TO NASA AND NON-NASA DDCS WITH NO	
*3			DISTRIBUTION LIMITATIONS AND TO THOSE AVAILABLE	
*4			TO NASA AND NASA CONTRACTORS	
*5			DO NOT USE THIS CODE FOR 1962 OR 1963 MATERIAL	

LEGEND
CODE LIMIT

00 to 09	Logical Equation
10	Security (1-6)
11	Acc. Range (Pos)
12	Acc. Range (Neg)
13	Acc. Series (A,N,X)
14	Document Type (00-09)
15	COSATI Category
16	Subject Category
17	Corporate Source (Term No.)
21	Contract No. (Root)
22	Personal Author (Root)
23	Report No. (Root)
25	No Foreign Lang.
29	Group Weights
30	Weight
31	Sort Option
32	Output Option
33	Hit Limit
40	Terms
*	Comment Card

KEYPUNCH INSTRUCTIONS

(= %---0-4-8 Punch
) = @---12-4-8 Punch
+ = &---12 Punch

NOTE: * Weight (col. 11-12) is usable only for terms.
** Ref. (col. 9-10) is usable only for terms.

FFNo 732 Jan 66

Fig. 61: Nuclear Propulsion - Document Type

3.5 SAMPLE OUTPUT FORMATS

Five out of a possible 16 output formats (also called print options) are shown in Figures 62 - 66.

```
N65-13870*
                                    UNCLASSIFIED        REPORT
ISSUE 04  CATEGORY 30
```

Fig. 62: Sample Output - Accession Number

```
N62-15935
N62-15935  GENERAL ELECTRIC CO., SCHENECTADY, N.Y.
DESIGN CRITERIA FOR BEARING SYSTEMS FOR USE IN
HIGH TEMPERATURE AIRCRAFT ELECTRICAL ACCESSORIES.
PHASE III.  □FINAL□  TECHNICAL REPORT  □MAY 1958
TO AUG. 1961□. P. LEWIS.  WRIGHT-PATTERSON AFB,
OHIO, FLIGHT DYNAMICS LAB., MAY 1962.  84 P.  7
REFS.  /CONTRACT AF 33/616/-5766/ /ASD-TR-61-232/
                                    UNCLASSIFIED        REPORT
ISSUE 15  CATEGORY 17
```

Fig. 63: Sample Output - Accession Number and Citation

```
A64-19100

 *ADHESIVE          BONDING          DESIGN
  EPOXY             JOINT            MATERIAL
  METAL            *METAL BONDING
 *METAL JOINT                       STRUCTURAL
  SURFACE                           UNCLASSIFIED        REPORT
ISSUE 14  CATEGORY 17
```

Fig. 64: Sample Output - Accession Number and Terms

```
N64-32678  OKLAHOMA STATE U. RESEARCH FOUNDATION,
STILLWATER.
THERMODYNAMIC PROPERTIES OF ZIRCONIUM AND
HAFNIUM HALIDES  QUARTERLY PROGRESS REPORT,
23 APR. - 16 JUL. 1964
FREEMAN, R. D.  GWINUP, P. D.  PARKS, W. C.  16
JUL. 1964  6 P
AF 33/615/-1449
QPR-2  AD-449606
  ANALYSIS          APPARATUS         CALORIMETER
  FAILURE          *HAFNIUM          *HALIDE
  PROPERTY          THERMODYNAMIC
 *THERMODYNAMIC PROPERTY
  VESSEL           *ZIRCONIUM
                                UNCLASSIFIED       REPORT
ISSUE 23  CATEGORY 10
```

Fig. 65: Sample Output - Accession Number, Citation and Terms

```
N64-17697* REPUBLIC AVIATION CORP., FARMINGDALE, N.Y.
SYNCHRONOUS METEOROLOGICAL SATELLITE /SMS/
STUDY.  VOLUME 3-  METEOROLOGICAL SENSORS
□FINAL REPORT□
17 JUN. 1963  187 P  REFS
NAS5-3189
NASA-CR-55930  RAC-1333  SSD-1027, VOL. 3  OTS-
$13.00 PH
SYNCHRONOUS METEOROLOGICAL SATELLITE SENSOR
  CLOUD             HYBRID            INFRARED
 *METEOROLOGICAL INSTRUMENT
 *METEOROLOGICAL SATELLITE
  PHOTOCONDUCTIVITY           PHOTOEMISS-
  ION               RADIATION         SATELLITE
 *SENSOR            SYNCHRONOUS
 *SYNCHRONOUS METEOROLOGICAL SATEL-
  LITE /SMS/        TUBE
                                UNCLASSIFIED       REPORT
WEIGHT  003
ISSUE 09  CATEGORY 15
```

Fig. 66: Sample Output - Accession Number, Citation, NOC, Terms, and Weight

3.6 NASA DECENTRALIZED SEARCH TAPE PROGRAM

At the present time there are over 30 organizations which receive copies of the Facility's tapes for decentralized searching. These "tape customers" include most of the NASA Research Centers, a number of major NASA contractors, and several university contractors participating in connection with NASA's Technology Utilization Program. The tapes are distributed in a developmental program for use in direct support of NASA work. In return for use of the NASA tape output, each user is an active participant in NASA's Information Systems and Development Program and provides feedback on tape usage and the experience gained. Each tape recipient is party to continuing refinement of techniques and contributes to improvements in data format and input procedures.

Tape users are initially provided with sets of the Linear File data on their own tapes, containing those accessions that they are qualified to receive. Subsequently, updates are accomplished by transmitting a single tape containing solely the new material. Updates are sent on either a biweekly or monthly basis, depending on need. Users are notified of updates and are expected to send tapes to the Facility in time to meet the schedule.

The above system has drastically reduced the number of tapes and the amount of tape handling which had been required by the old inverted system. From time to time, however, complete tape sets for each user will be updated at the Facility in order to reflect "kills," supersessions, and other types of corrections to the earlier data.

APPENDIX A

JOURNAL ANNOUNCEMENT CATEGORIES

Categories	1962	1963–1964	1965
01	General	General	Aerodynamics
02	Aerodynamics of Bodies and Component Combinations	Aerodynamics of Bodies, Combinations, and Internal Flow	Aircraft
03	Aerodynamics of Inlets, Ducts, and Nozzles	Aerodynamics of Wings, Rotors, and Control Surfaces	Auxiliary Systems
04	Aerodymamics of Propellers and Rotors	Aircraft	Biosciences
05	Aerodynamics of Wings and Control Surfaces	Astronomy and Astrophysics	Biotechnology
06	Aircraft	Auxiliary Systems	Chemistry
07	Auxiliary Systems	Chemistry	Communications
08	Chemistry	Communications	Computers
09	Communication, Navigation, and Guidance	Electronics	Electronic Equipment
10	Facilities	Facilities, Research and Support	Electronics
11	Fluid Mechanics	Same	Facilities, Research, and Support
12	Geophysics	Same	Fluid Mechanics
13	Hydrodynamics	Heat Transfer and Hydrodynamics	Geophysics
14	Industrial Technologies and Mechanical Equipment	Human Behavior	Instrumentation and Photography
15	Instrumentation	Instrumentation and Photography	Machine Elements and Processes

Appendix A—Journal Announcement Categories

Categories	1962	1963–1964	1965
16	Life Sciences and Life Support Systems	Life Sciences	Masers
17	Lubrication, Friction, and Wear	Machine Elements and Processes	Materials, Metallic
18	Materials Sciences	Materials, Metallic	Materials, Nonmetallic
19	Mathematics	Materials, Nonmetallic	Mathematics
20	Operation Problems	Mathematics	Meteorology
21	Physics	Meteorology	Navigation
22	Propellants and Fuels	Navigation and Guidance	Nuclear Engineering
23	Propulsion - General	Physics, General	Physics, General
24	Propellants - Air Breathing Units	Physics, Plasma	Physics, Atomic, Molecular, and Nuclear
25	Propulsion - Electric Units	Physics, Solid State	Physics, Plasma
26	Propulsion - Nuclear Units	Propellants and Combustion	Physics, Solid State
27	Prupulsion - Rocket Units	Propulsion	Propellants
28	Space Sciences	Space Radiation	Propulsion Systems
29	Space Vehicles	Space Sciences	Space Radiation
30	Spacecraft	Space Vehicles	Space Sciences
31	Stability and Control of Aircraft and Spacecraft	Space Vehicles (Launch Vehicles)	Space Vehicles
32	Structural Engineering	Space Vehicles (Spacecraft)	Structural Mechanics
33	Thermal Phenomena	Stresses and Loads	Thermodynamics and Combustion
34		Structural Design	General

APPENDIX B*

COSATI SUBJECT CATEGORY LIST

Field Structure

01 Aeronautics

02 Agriculture

03 Astronomy and Astrophysics

04 Atmospheric Sciences

05 Behavioral and Social Sciences

06 Biological and Medical Sciences

07 Chemistry

08 Earth Sciences and Oceanography

09 Electronics and Electrical Engineering

10 Energy Conversion (Non-propulsive)

11 Materials

12 Mathematical Sciences

13 Mechanical, Industrial, Civil, and Marine Engineering

14 Methods and Equipment

15 Military Sciences

16 Missile Technology

17 Navigation, Communications, Detection, and Countermeasures

18 Nuclear Science and Technology

19 Ordnance

20 Physics

21 Propulsion and Fuels

22 Space Technology

*Reprinted from COSATI Subject Category List (Ref. 13).

Field and Group Structure

01 Aeronautics

A. Aerodynamics
B. Aeronautics
C. Aircraft
D. Aircraft flight control and instrumentation
E. Air facilities

02 Agriculture

A. Agricultural chemistry
B. Agricultural economics
C. Agricultural engineering
D. Agronomy and horticulture
E. Animal husbandry
F. Forestry

03 Astronomy and Astrophysics

A. Astronomy
B. Astrophysics
C. Celestial mechanics

04 Atmospheric Sciences

A. Atmospheric physics
B. Meteorology

05 Behavioral and Social Sciences

A. Administration and management
B. Documentation and information technology
C. Economics
D. History, law and political science
E. Human factors engineering
F. Humanities
G. Linguistics
H. Man-machine relations
I. Personnel selection, training and evaluation
J. Psychology (Individual and group behavior)
K. Sociology

06 Biological and Medical Sciences

A. Biochemistry
B. Bioengineering
C. Biology
D. Bionics
E. Clinical medicine
F. Environmental biology

06 Biological and Medical Sciences—Continued

- G. Escape, rescue and survival
- H. Food
- I. Hygiene and sanitation
- J. Industrial (occupational) medicine
- K. Life support
- L. Medical and hospital equipment
- M. Microbiology
- N. Personnel selection and maintenance (medical)
- O. Pharmacology
- P. Physiology
- Q. Protective equipment
- R. Radiobiology
- S. Stress physiology
- T. Toxicology
- U. Weapon effects

07 Chemistry

- A. Chemical engineering
- B. Inorganic chemistry
- C. Organic chemistry
- D. Physical chemistry
- E. Radio and radiation chemistry

08 Earth Sciences and Oceanography

- A. Biological oceanography
- B. Cartography
- C. Dynamic oceanography
- D. Geochemistry
- E. Geodesy
- F. Geography
- G. Geology and mineralogy
- H. Hydrology and limnology
- I. Mining engineering
- J. Physical oceanography
- K. Seismology
- L. Snow, ice and permafrost
- M. Soil mechanics
- N. Terrestrial magnetism

09 Electronics and Electrical Engineering

- A. Components
- B. Computers
- C. Electronic and electrical engineering
- D. Information theory
- E. Subsystems
- F. Telemetry

10 Energy Conversion (Non-propulsive)

- A. Conversion techniques
- B. Power sources
- C. Energy storage

11 Materials

- A. Adhesives and seals
- B. Ceramics, refractories and glasses
- C. Coatings, colorants and finishes
- D. Composite materials
- E. Fibers and textiles
- F. Metallurgy and metallography
- G. Miscellaneous materials
- H. Oils, lubricants, and hydraulic fluids
- I. Plastics
- J. Rubbers
- K. Solvents, cleaners and abrasives
- L. Wood and paper products

12 Mathematical Sciences

- A. Mathematics and statistics
- B. Operations research

13 Mechanical, Industrial, Civil, and Marine Engineering

- A. Air conditioning, heating, lighting and ventilating
- B. Civil engineering
- C. Construction equipment, materials and supplies
- D. Containers and packaging
- E. Couplings, fittings, fasteners and joints
- F. Ground transportation equipment
- G. Hydraulic and pneumatic equipment
- H. Industrial processes
- I. Machinery and tools
- J. Marine engineering
- K. Pumps, filters, pipes, fittings, tubing and valves
- L. Safety engineering
- M. Structural engineering

14 Methods and Equipment

- A. Cost effectiveness
- B. Laboratories, test facilities, and test equipment
- C. Recording devices
- D. Reliability
- E. Reprography

15 Military Sciences

A. Antisubmarine Warfare
B. Chemical, biological, and radiological warfare
C. Defense
D. Intelligence
E. Logistics
F. Nuclear warfare
G. Operations, strategy, and tactics

16 Missile Technology

A. Missile launching and ground support
B. Missile trajectories
C. Missile warheads and fuses
D. Missiles

17 Navigation, Communications, Detection and Countermeasures

A. Acoustic detection
B. Communications
C. Direction finding
D. Electromagnetic and acoustic countermeasures
E. Infrared and ultraviolet detection
F. Magnetic detection
G. Navigation and guidance
H. Optical detection
I. Radar detection
J. Seismic detection

18 Nuclear Science and Technology

A. Fusion devices (Thermonuclear)
B. Isotopes
C. Nuclear explosions
D. Nuclear instrumentation
E. Nuclear power plants
F. Radiation shielding and protection
G. Radioactive wastes and fission products
H. Radioactivity
I. Reactor engineering and operation
J. Reactor materials
K. Reactor physics
L. Reactors (Power)
M. Reactors (Non-power)
N. SNAP technology

19 Ordnance

A. Ammunition, explosives, and pyrotechnics
B. Bombs
C. Combat vehicles

19 Ordnance—Continued

D. Explosions, ballistics, and armor
E. Fire control and bombing systems
F. Guns
G. Rockets
H. Underwater ordnance

20 Physics

A. Acoustics
B. Crystallography
C. Electricity and magnetism
D. Fluid mechanics
E. Masers and lasers
F. Optics
G. Particle accelerators
H. Particle physics
I. Plasma physics
J. Quantum theory
K. Solid mechanics
L. Solid-state physics
M. Thermodynamics
N. Wave propagation

21 Propulsion and Fuels

A. Air-breathing engines
B. Combustion and ignition
C. Electric propulsion
D. Fuels
E. Jet and gas turbine engines
F. Nuclear propulsion
G. Reciprocating engines
H. Rocket motors and engines
I. Rocket propellants

22 Space Technology

A. Astronautics
B. Spacecraft
C. Spacecraft trajectories and reentry
D. Spacecraft launch vehicles and ground support

APPENDIX C

ACCESSION SERIES — DEFINITIONS

Series	Definitions	On Microfiche	Secondary Distribution of Documents by Facility
A-10,000	Open Literature items accessioned by the American Institute of Aeronautics and Astronautics and announced in International Aerospace Abstracts. Cataloged, indexed, abstracted.	Yes*	No
N-10,000	Items announced in Scientific and Technical Aerospace Reports (STAR). Unclassified documents of sufficient scientific/technical significance to warrant general announcement. Cataloged, indexed, abstracted.	Yes	Yes
X-10,000	Documents announced in Classified Scientific and Technical Aerospace Reports (CSTAR). Documents are classified, or carry distribution limitations, or both. Cataloged, indexed, abstracted.	Yes	Yes
N-60,000	A closed series, used to produce NASA-SP-9 in 1962. Cataloged, indexed, abstracted.	Yes	Yes
X-60,000	A closed series, used to produce NASA-SP-9, Classified Supplement in 1962. Cataloged, indexed, abstracted.	Yes	Yes
A-80,000	Open literature items contributed by the Library of Congress to the "Continuing Bibliography" Aerospace Medicine and Biology (NASA-SP-7011).	No	No
N-80,000	Older unclassified materials not suitable for announcement in a current abstract journal. Cataloged, indexed.	No	Yes
X-80,000	Older classified or limited distribution documents not suitable for announcement in a current abstract journal. Cataloged, indexed.	No	Yes
N-90,000	Unclassified documents, which, because of limited technical scope, are placed under minimum bibliographic control for record purposes only. Cataloged.	No	Yes
X-90,000	Classified or limited distribution documents, which, because of limited technical scope are placed under minimum bibliographic control for record purposes only. Cataloged.	No	Yes

*Microfiche of selected items produced by AIAA. For sale by that organization.

APPENDIX D*

NACA/NASA REPORT SERIES NUMBERING SYSTEMS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

AC-
ACR-(LETTER)(DATE CODE)-
ARR-(LETTER)(DATE CODE)-
CB-(LETTER)(DATE CODE)-
MR-(LETTER)(DATE CODE)-
NACA-
NACA-(LETTERS)-A(DATE CODE)-
NACA-(LETTERS)-E(DATE CODE)-
NACA-(LETTERS)-H(DATE CODE)-
NACA-(LETTERS)-L(DATE CODE)-
NACA-AC-
NACA-ACR-(DATE)-
NACA-ACR-(LETTER)(DATE CODE)-
NACA-ARR-(DATE)-
NACA-ARR-(LETTER)(DATE CODE)-
NACA-CB-(DATE)-
NACA-CB-(LETTER)(DATE CODE)-
NACA-MR-(DATE)-
NACA-MR-(LETTER)(DATE CODE)-
NACA-RB-(DATE)-
NACA-RB-(LETTER)(DATE CODE)-
NACA-REPORT-
NACA-RM-(LETTER)(DATE CODE)-
NACA-RM-S-
NACA-RM-SE-
NACA-RM-SL
NACA-TM-
NACA-TN-
NACA-WR-(LETTER)-
RB-(LETTER)(DATE CODE)-
RM-(LETTER)(DATE CODE)-
WR-(LETTER)-

The National Advisory Committee for Aeronautics maintained eleven publication series for its reports, including those issued from Headquarters and from its various laboratories. Reports in four of these series were numbered consecutively without additional identification. These were:

NACA-AC-	Aircraft Circulars
NACA-REPORT-	Reports
NACA-TM-	Technical Memoranda
NACA-TN-	Technical Notes

One series was numbered consecutively but also carried a letter designating the laboratory of origin: NACA-WR-(LETTER)- Wartime Reports.

The other series depended on the date of issuance and later a date symbol combined with a letter for the laboratory of origin for identification. These series were:

NACA-ACR-	Advance Confidential Reports
NACA-ARR-	Advance Restricted Reports
NACA-CB-	Confidential Bulletins
NACA-MR-	Memorandum Reports
NACA-RB-	Restricted Bulletins
NACA-RM-	Research Memoranda

These series were at times referred to without the NACA prefix.

The codes used to indicate the laboratory of origin and the date of issuance were as follows:

Laboratory-	A	Ames Aeronautical Lab., Moffett Field, Calif.
	E	Aircraft Engine Research Lab., Cleveland Flight Propulsion Research Lab., Cleveland Lewis Flight Propulsion Lab., Cleveland
	H	High-Speed Flight Station, Edwards Air Force Base, Calif.
	L	Langley Aeronautical Lab., Langley Field, Va. Langley Memorial Aeronautical Lab., Langley Field, Va.
Year-	3	1943
	4	1944
	5	1945 etc.
	50	1950
	51	1951
	52	1952 etc.

Month-	A	January	G	July
	B	February	H	August
	C	March	I	September
	D	April	J	October
	E	May	K	November
	F	June	L	December

*Reprinted from SLA's Dictionary of Report Series Codes (Ref. 1).

Day- 01
02
03 etc. to 31
followed by
a 2nd document issued that date
b 3rd document issued that date

These codes were assembled in the form:
NACA ACR E4D19
NACA ARR L4K22b
NACA CB E5J11
NACA MR A4L12
NACA RB L5F15

The NACA series were succeeded by the NASA series of the National Aeronautics and Space Administration (*See* Ref. 26).

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA-
NASA-(LETTERS)-A-
NASA-(LETTERS)-E-
NASA-(LETTERS)-H-
NASA-(LETTERS)-L-
NASA-(LETTERS)-W-
NASA-M-(DATE)(LETTER)-
NASA-MEMO-(DATE)(LETTER)-
NASA-MEMORANDUM-(DATE)(LTR)-
NASA-RE-(DATE)(LETTER)-
NASA-REPUBLICATION-(DATE)(LTR)-
NASA-TM-X
NASA-TN-D-
NASA-TR-R-
NASA-TT-F-

The National Aeronautics and Space Administration's publication series supersede those of the National Advisory Committee for Aeronautics (*See* Ref. 25). Four series are published, Technical Reports, Technical Notes, Technical Memoranda and Technical Translations (previously called Republications). Until July 1959, reports in these series were identified by date with a suffix letter indicating the source within NASA. These letters were:

A Ames Research Center, Moffet Field, Calif.
E Lewis Research Center, Cleveland
H High-Speed Flight Station, Edwards, Calif.
L Langley Research Center, Langley Field, Va.
W NASA Headquarters, Washington, D.C.

Since July 1959 reports in the four series have been numbered consecutively, regardless of place of origin. The form used for the series is:

NASA-TR-R-	Technical Reports
NASA-TN-D-	Technical Notes
NASA-TM-X-	Technical Memoranda
NASA-TT-F-	Technical Translations

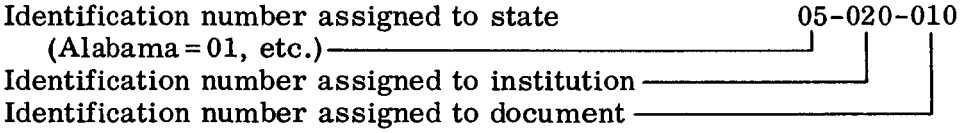
APPENDIX E

NASA CONTRACT NUMBER PREFIXES

NAS1	Langley Research Center
NAS2	Ames Research Center
NAS3	Lewis Research Center
NAS4	Flight Research Center
NAS5	Goddard Space Flight Center
NAS6	Wallops Island
NAS7	Western Operations Office
NAS8	Marshall Space Flight Center
NAS9	Manned Spacecraft Center
NAS10	John F. Kennedy Space Flight Center
NAS11	None
NAS12	Electronics Research Center
NASw	NASA Headquarters
NASr	NASA Headquarters
NsG	NASA Headquarters

All new grants or contracts starting July 1, 1964 are being numbered under the new life-time control numbering system.

1. Basic Life-time Control Number



2. Prefixes Under Life-time Control System

NGR - Research Grant
NGF - Facility Grant
NGT - Training Grant
NSR - Research Contract
R - Purchase Order or Intergovernmental Transfer of Funds

3. Existing grants or contracts which are continued will be numbered under the old numbering system, i.e., a supplement to NsG-224 will be numbered NsG-224, Supplement No. 1. However, whenever possible a new grant or contract will be awarded under the new life-time control numbering system.

APPENDIX F

SELECTED NACA/NASA BIBLIOGRAPHIC REFERENCE WORKS*

AERONAUTICAL ENGINEERING INDEX (See further "Aero/Space Engineering Index")

1947-57

AERONAUTICAL ENGINEERING REVIEW (See also "Aero/Space Engineering Index" - See formerly "Journal of the Aeronautical Society, Aeronautical Review Section" - See further "Aerospace Engineering")

AERONAUTICS AND SPACE BIBLIOGRAPHY FOR THE SECONDARY GRADES
NASA, Washington, D. C., 1963. Second edition. Compiled for NASA by the National Aerospace Education Council. 50 p. (NASA-EP-2) GPO: $0.35

AERONAUTICS AND SPACE BIBLIOGRAPHY OF ADULT AEROSPACE BOOKS AND MATERIALS
NASA, Washington, D. C., 1963. Second edition. Compiled for NASA by the National Aerospace Education Council. 42 p. (NASA-EP-3) $0.30

AERO/SPACE ENGINEERING
Institute of the Aerospace Sciences, Inc., New York, N. Y.
Monthly, since 1940; ceased publication Dec. 1960.

Vol. 8, Nov. 1940-Oct. 1941 "Journal of the Aeronautical Society, Aeronautical Review Section"
Vol. 1-17, 1942-June 1958 "Aeronautical Engineering Review"
Vol. 17-19, July 1958-1960 "Aero/Space Engineering"

AERO/SPACE ENGINEERING INDEX
Institute of the Aeronautical Sciences, New York, N. Y.
Annually, since 1947; ceased publication Dec. 1958; see "Aero/Space Engineering", for which this is the cumulation; subject classification, with alphabetical arrangement of classes and subclasses and an author index.

1947-57 "Aeronautical Engineering Index"
1958 "Aero/Space Engineering Index"

AEROSPACE MEDICINE. SECTION: ABSTRACTS OF CURRENT LITERATURE
Aerospace Medical Association, St. Paul, Minn.
Monthly, since 1959; supported by NASA; annual subject and author indexes cumulated for 3-year periods; covers world literature; selected abstracts from material prepared by Library of Congress; subject classification.

* The assistance of the library staff of NASA's Langley Research Center in the gathering of bibliographic details relating to pre-1962 publications is gratefully acknowledged.

Nov. and Dec. 1958 "Journal of Aviation Medicine"
1959- "Aerospace Medicine"
3-year cumulative index for 1959-61
3-year cumulative index for 1962-64

AEROSPACE MEDICINE AND BIOLOGY: AN ANNOTATED BIBLIOGRAPHY

Science and Technology Division, Library of Congress, Washington, D. C.
Annually, since 1956; sponsored in part by NASA; author, corporate source, and subject indexes; cumulative index for Vol. 1-6; covers world literature; subject classification; available from CFSTI.

Vol. 1 (covers 1952) pub. 1956 "Aviation Medicine"
Vol. 2 (covers 1953) pub. 1959 " "
Vols. 3-6 (cover 1954-57) pub. 1960-63 "Aerospace Medicine and Biology: An Annotated Bibliography"
Volumes covering literature from 1958-63 in preparation.
Continued on current basis since 1964 by "Aerospace Medicine and Biology - A Continuing Bibliography".

AEROSPACE MEDICINE AND BIOLOGY - A CONTINUING BIBLIOGRAPHY

Compiled by NASA Scientific and Technical Information Facility through the cooperative efforts of Aerospace Medicine and Biology Bibliography Project (AMBBP) of the Library of Congress, the American Institute of Aeronautics and Astronautics, and NASA.
Monthly, since 1964; abstracts cover current journal, book, and report literature; subject, author, and corporate source indexes; continues on current basis "Aerospace Medicine and Biology: An Annotated Bibliography"; available from CFSTI.

July 1964- (NASA-SP-7011 and supplements)

ASTRONAUTICS INFORMATION ABSTRACTS (See further "Astronautics Information Abstracts: Reports and Open Literature Survey")

Jet Propulsion Laboratory, Calif. Inst. of Tech., Pasadena, Calif.
Monthly, since 1960; monthly author, subject, and source indexes cumulated to date of publication, annual cumulated indexes; about 1,200 abstracts a year of technical reports; alphabetical subject classification.

Vol. 1-5, 1960 - June 1962

ASTRONAUTICS INFORMATION ABSTRACTS: REPORTS AND OPEN LITERATURE SURVEY

Jet Propulsion Laboratory, Calif. Inst. of Tech., Pasadena, Calif.
Monthly, since July 1962; ceased publication with Vol. 8, 1963; about 4,000 abstracts a year; alphabetical subject classification.

Vol. 6-8 July 1962-1963

AERONAUTICS INFORMATION (Literature Searches)
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif.
Irregular, since 1959; these bibliographies are prepared at the request of the technical staff of JPL and are published for distribution to interested organizations; confidential and unclassified annotated bibliographies, with updated supplements, on specific subjects in the astronautics areas of current interest; subject classifications with author indexes.

ASTRONAUTICS INFORMATION: OPEN LITERATURE SURVEY (See further "Astronautics Information Abstracts: Reports and Open Literature Survey")
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif.
Monthly, since 1959; monthly periodical index, monthly author and subject indexes cumulated to date of publication, annual cumulated indexes; about 3,000 abstracts a year from 350 American and foreign journals; alphabetical subject classification.

Vol. 1-5, 1960 - June 1962

BALLISTOCARDIOGRAPHY - A BIBLIOGRAPHY
NASA, Scientific and Technical Information Division, Washington, D. C., September 1965. 46 p. (NASA-SP-7021; FAA-AM-65-15) GPO: $0.35. A selected bibliography of reports and journal articles, of both domestic and foreign origin, published during the period 1877-1964. Prepared by staff members of the FAA and published jointly by FAA and NASA.

BIBLIOGRAPHIES ON AEROSPACE SCIENCE - A CONTINUING BIBLIOGRAPHY
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since August 1964; abstracts unclassified reports and journal articles introduced into the NASA Information System; subject indexes; available from CFSTI.

1964- NASA-SP 7006, and supplements (First issue covers January 1962-May 1964)

BIBLIOGRAPHY RELATED TO HUMAN FACTORS SYSTEM PROGRAM (July 1962-February 1964)
R.J. Potocko. NASA, Washington, D. C., 1964.
237 p. (NASA-SP-7014) CFSTI: $3.50. A bibliography divided into 18 categories covering the areas of human research and performance, man-systems integration, and life support and protective systems. Also, relevant listings under the categories of liology, physiology, and psychology. Includes information for locating an abstract in either Scientific and Technical Aerospace Reports (STAR) or International Aerospace Abstracts (IAA).

CLASSIFIED SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS (See formerly "Confidential Technical Publications Announcements")
NASA, Scientific and Technical Information Division, Washington, D. C.
Semimonthly, since 1951; limited distribution companion to STAR; the first section contains informative abstracts and complete bibliographic citations, arranged in subject categories, on world-wide report literature on the science and technology of space and aeronautics; a second section consists of five indexes: subject, corporate source, author, report number, and accession number; separate indexes are published quarterly with an annual cumulative volume.

Note: from 1951-61 the NACA/NASA published an announcement bulletin with abstracts covering British, AGARD, and NACA/NASA publications; these bulletins are no longer available.

Vol. 2, July-Dec. 1962 (covers Jan.-Dec.1962)"Confidential Technical Publications Announcements"
Vol. 1, 1963-"CSTAR"

CLARITY IN TECHNICAL REPORTING

S. Katzoff. NASA, Scientific and Technical Information Division, Washington, D. C., 1964. 25 p. (NASA-SP-7010) GPO: $0.15.
This booklet offers commonsense suggestions for improving written technical reports. In particular, it discusses basic attitudes, some elements of composition, the organization and contents of the report, and the editorial review. Since technical information is transmitted not only in written reports but also in talks and lectures , a section is devoted to the technical talk--the orally delivered technical report. In both written and oral reports, stress is placed on striving for clarity.

COMMUNICATIONS SATELLITES - A CONTINUING BIBLIOGRAPHY

NASA, Scientific and Technical Information Division, Washington, D. C. Irregular, since July 1964; abstracts unclassified reports and journal articles introduced into the NASA Information System; subject and author indexes; available from CFSTI.

1964- NASA-SP-7004, and supplements (First issue covers Jan.1962-Ap. 1964)

CONFIDENTIAL TECHNICAL PUBLICATIONS ANNOUNCEMENTS (See further "Classified Scientific and Technical Aerospace Reports")

Note: for NASA/NACA publications prior to Jan. 1962 see "Index of NASA Technical Publications."

Vol. 2, July-Dec. 1962 "CTPA " (covers Jan.-Dec. 1962)

CONTRACT NUMBER INDEX TO REPORTS ANNOUNCED IN CSTAR

NASA, Scientific and Technical Information Division, Washington, D. C. Annual

1962-63	NASA-SP-7001	CFSTI: $3.00
1964	NASA-SP-7019	

CURRENT AEROSPACE RESEARCH ACTIVITIES

NASA, Scientific and Technical Information Division, Washington, D. C. Irregular, since v. 1, no. 1, March 1963; for use by NASA offices and Centers only; lists contract, grant and other research activities in progress, not documents; "CARA"

EXTRATERRESTRIAL LIFE - A BIBLIOGRAPHY, PART I: REPORT LITERATURE

(J. Waldo, comp.) NASA, Scientific and Technical Information Division, Washington, D. C., September 1964. 76 p. (NASA-SP-7015) GPO: $0.45
A selected listing of annotated references to unclassified scientific and technical reports, 1952-64. Although primarily concerned with the general subjects of extraterrestrial life and exobiology, the bibliography includes references on such related topics as the origin of life on earth and terrestrial contamination of spacecraft. Entries are indexed by subject, author, corporate source, and contract number. Part II, when published, will be comprised of a compilation of references to journal articles and books that have been published between 1900 and 1964.

FLASH SHEETS (See also "Index to NASA Tech Briefs")
NASA, Technology Utilization Division, Washington, D. C.
Irregular, since 1962; for NASA use only; abstracts innovations derived from the NASA space program which may be of interest to industry; subject, innovator, and "Flash Sheet" number indexes issued quarterly with annual cumulation; selected Flash Sheets are issued as NASA Tech Briefs.

1962- "Flash Sheets"
Jan. 1965 Cumulative Index of Flash Sheets, 1963-64.

GUIDE TO THE SUBJECT INDEXES FOR SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since April 1964; a listing of subject terms (basic index points and cross-references) that have been used in the indexes to STAR and IAA. Published to enable persons searching the literature to use the subject indexes efficiently and rapidly. Supersedes the "Guide to the Subject Index for Technical Publications Announcements," December 31, 1962; available from CFSTI.

1964- NASA-SP-7016, and revisions

HIGH ENERGY PROPELLANTS, A CONTINUING BIBLIOGRAPHY
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since 1964; abstracts unclassified reports and journal articles introduced into the NASA Information System; subject and author indexes; available from CFSTI.

1964- NASA-SP-7002, and supplements (First issue covers Jan.1962-Mar.1964)

INDEX OF CONFIDENTIAL NASA TECHNICAL PUBLICATIONS (See further "Technical Publications Announcements")
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since 1947; covers NACA/NASA classified publications issued from 1915 (the date of origin of NACA) to Jan. 1962; subject classification with corporate source, author, subject, and report number indexes; ceased publication with NASA-SP-9 Supplement.

1947 (covers 1915-47) "Index of NACA Classified Publications"
1947 (covers 1915-47) "Index of NACA Proprietary Publications"
Dec. 1957 (covers 1948-57) "Index of NACA Technical Publications (Confidential)
Sept. 1958 (covers Jan. 1958-June 1960) "Index of NASA Technical Publications" (Confidential)
NASA-SP-9 Supplement (covers July 1960-Dec. 1961) "Index of Confidential NASA Technical Publications"

INDEX OF NACA PROPRIETARY PUBLICATIONS (See further "Index of NACA Technical Publications" (Confidential))

1947 (covers 1915-47)

INDEX OF NACA CLASSIFIED PUBLICATIONS (See further "Index of NACA Technical Publications (Confidential))

1947 (covers 1915-47)

INDEX OF NACA TECHNICAL PUBLICATIONS (Unclassified) (See further "Index of NASA Technical Publications")

1950-59 (covers 1949-Sept. 1958)

INDEX OF NACA TECHNICAL PUBLICATIONS (confidential) (See further "Index of NASA Technical Publications" (confidential))

Dec. 1957 (covers 1948-57)

INDEX OF NASA TECHNICAL PUBLICATIONS (Unclassified) (See formerly "Index of NACA Technical Publications" - See further "Technical Publications Announcements" NASA, Scientific and Technical Information Division, Washington, D. C. Irregular, since 1950; covers NACA/NASA unclassified publications issued from 1915 (the date of origin of NACA) to January 1962; subject classification with corporate source, author, subject, and report number indexes; ceased publication with NASA-SP-9.

1950-59 (covers 1949-Sept. 1958) "Index of NACA Tech. Publications"
1959 (covers Oct. 1958-June 1959) "Index of NASA Tech. Publications"
1960 (covers July 1959-June 1960) "Index of NASA Tech. Publications"
NASA-SP-9 (Known informally as GAP because it covers the period between the Index and the beginning of operations by the NASA Facility) covers July 1960-Dec. 1961 "Index of NASA Tech. Publications"

INDEX OF NASA TECHNICAL PUBLICATIONS (Confidential) (See further "Index of Confidential NASA Technical Publications")

Sept. 1958 (covers Jan. 1958-June 1960)

INDEX TO NASA NEWS RELEASES AND SPEECHES
NASA, Scientific and Technical Information Division, Washington, D. C. Semiannual, with annual cumulation; an index to news releases, speeches, news conferences, transcripts, press briefings, and other information releases issued by NASA Headquarters.

1963-1964
January-June 1965

INDEX TO NASA TECH BRIEFS (See also "Flash Sheets")
NASA, Technology Utilization Division, Washington, D. C.
Quarterly, since January 1965; indexed by subject, originating NASA Research Center, and "Tech Brief" number; "Tech Briefs" are issued to acquaint industry with the technical content of an innovation derived from the NASA space program; arranged by subject categories. CFSTI: $1.00

January 1965- NASA-SP-5021, and supplements

Appendix F—Selected NACA/NASA Bibliographic Reference Works

INTERNATIONAL AEROSPACE ABSTRACTS (See formerly "Aero/Space Engineering")
American Institute of Aeronautics and Astronautics, Technical Information Service, New York, N. Y.
Semimonthly, since 1940; sponsored by NASA since 1963; author, subject and corporate source indexes; separate cumulative index volumes; 28,000 abstracts annually on world literature.

Vol. 8, Nov. 1940-Oct. 1941 "Journal of the Aeronautical Society, Aero. Review Sec."
Vol. 1-17, 1942-June 1958 "Aeronautical Engineering Review"
Vol. 17-19, July 1958-1960 "Aero/Space Engineering"
Vol. 1, 1961 - "International Aerospace Abstracts"

JOURNAL OF AVIATION MEDICINE. SECTION: ABSTRACTS OF CURRENT LITERATURE
(See further "Aerospace Medicine")

Nov. and Dec. 1958

JOURNAL OF THE AERONAUTICAL SOCIETY, AERONAUTICAL REVIEW SECTION (See further "Aeronautical Engineering Review")

Vol. 8, Nov. 1940-Oct. 1941

LASERS AND MASERS - A CONTINUING BIBLIOGRAPHY
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since May 1965; abstracts unclassified reports and journal articles introduced into the NASA Information System; subject and author indexes; available from CFSTI.

1965- NASA-SP-7009, and supplements (First issue covers Jan. 1962-Feb. 1965)

LIST OF SELECTED REFERENCES ON NASA PROGRAMS
Prepared for NASA by the Science and Technology Division of the Library of Congress, Washington, D. C. U. S. Gov. Print. Off. 1962 236 p. (NASA-SP-3; GPO: $1.25

LUBRICATION, CORROSION AND WEAR - A CONTINUING BIBLIOGRAPHY
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since June 1965; abstracts unclassified reports and journal articles introduced into the NASA Information System; subject and author indexes; available from CFSTI.

1965- NASA-SP-7020, and supplements (First issue covers Jan. 1962-Mar. 1965)

LUNAR SURFACE STUDIES - A CONTINUING BIBLIOGRAPHY
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since 1964; abstracts unclassified reports and journal articles introduced into the NASA Information System; subject index; available from CFSTI.

1964- NASA-SP-7003, and supplements (First issue covers Jan. 1962-Mar. 1964)

NASA CLASSIFICATION CHANGE NOTICES
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since December 1, 1962; numbered consecutively; constitutes authority to make the prescribed classification changes to documents identified therein; "CCN"

NASA PUBLICATIONS MANUAL
NASA, Scientific and Technical Information Division, Washington, D. C.
1964. 74 p. (NASA-SP-7013) GPO: $0.45
This is a draft edition of a manual for preparing scientific and technical reports. Certain types of reports to be issued under NASA sponsorship are described. A section on format is concerned with the physical appearance and reproduction procedures, and samples are provided to illustrate setups to be followed. Subsequent sections advise authors and editors on organization, content, and general style.

NASA TRANSLATION LIST
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since July 21, 1961; consecutively numbered. Designed to announce the availability of NASA translations and to avoid unnecessary duplication in translation efforts.

PLANETARY ATMOSPHERES - A CONTINUING BIBLIOGRAPHY
NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since June 1965; abstracts unclassified reports and journal articles introduced into the NASA Information System; subject and author indexes; available from CFSTI.

1965- NASA-SP-7017, and supplements (First issue covers Jan. 1962-Feb. 1965)

RELIABILITY ABSTRACTS AND TECHNICAL REVIEWS
NASA, Office of Reliability and Quality Assurance, Washington, D. C.
Prepared by Research Triangle Institute under NASA contract.
Monthly with annual cumulations, since 1961; author index cumulated for the first 1,300 abstracts; an abstracting, indexing, and review service for technical literature on reliability; arranged subjectwise in large categories.

REPROTYPING AND LAYOUT--PREPARING CONTRACTOR REPORTS FOR NASA
NASA, Scientific and Technical Information Division, Washington, D. C.
May 1964. 14 p. (NASA-SP-7007)
The purpose of this booklet is to offer a few ground rules to enable, with a minimum of effort, the production of a perfectly suitable reproducible copy. Topics discussed are these: (1) the typewriter--its condition; (2) the reproducible layout sheet; (3) section headings; (4) spacing; (5) hyphenation; (6) error correction; (7) typing tables and figures; (8) the reproducible layout; (9) figuring reductions; and (10) typing equations.

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS (STAR) (See formerly "Technical Publications Announcements")
NASA, Scientific and Technical Information Division, Washington, D. C.
Printed at GPO.
Semimonthly, since 1963, the first section contains informative abstracts and complete bibliographic citations, arranged in subject categories, on world-wide report literature on the science and technology of space and

aeronautics; a second section consists of five indexes: subject, corporate source, author, report number, and accession number; separate indexes are published quarterly with an annual cumulative volume.

Note: from 1951-61 the NACA/NASA published an irregular announcement bulletin with abstracts covering British, AGARD, and NACA/NASA publications. Their titles varied, e.g., Research Abstracts, Publications Announcements, Technical Publications Announcements. These bulletins are no longer available.

Vol. 1, 1963-

A SELECTED LISTING OF NASA SCIENTIFIC AND TECHNICAL REPORTS

NASA, Scientific and Technical Information Division, Washington, D. C.
An annual annotated listing of NASA reports and journal articles that were announced in Scientific and Technical Aerospace Reports (STAR). Included are Special Publications, Technical Reports, Technical Notes, Technical Memorandums, Technical Translations, Technical Reprints, and Contractor Reports. The arrangement of this publication is the same as that of STAR.

1963 NASA-SP-7005 CFSTI: $3.50
1964 NASA-SP-7018 CFSTI: $5.25

SPACE COMMUNICATIONS: THEORY AND APPLICATIONS

R. F. Filipowsky and L. C. Bickford, comps. NASA, Scientific and Technical Information Division, Washington, D. C.
June-July 1965. 4 vols. (NASA-SP-7022)

Vol. 1: Modulation and Channels. NASA-SP-7022 (01) GPO: $2.50
Vol. 2: Coding and Detection Theory. NASA-SP-7022 (02) GPO: $2.25
Vol. 3: Information Processing and Advanced Techniques. NASA-SP-7022 (03) GPO: $2.50
Vol. 4: Satellite and Deep Space Applications. NASA-SP-7022 (04) GPO: $1.75

An extensive collection of annotated references to reports, journal articles, and books published during the period 1958-1963.

SPECIAL ANNOUNCEMENT BULLETIN

NASA, Scientific and Technical Information Division, Washington, D. C.
Irregular, since April 30, 1964; numbered consecutively; lists documents restricted in distribution to NASA offices and NASA centers, i.e., the X35,000 accession series; "SAB"

SURVEY OF THE LITERATURE ON THE SOLAR CONSTANT AND THE SPECIAL DISTRIBUTION OF SOLAR RADIANT FLUX

M.P. Thekaekara (GSFC). NASA, Washington, D. C., 1965. 43 p. (NASA-SP-74)
CFSTI: $2.00

TECHNICAL ILLUSTRATING-- PREPARING CONTRACTOR REPORTS FOR NASA

NASA, Scientific and Technical Information Division, Washington, D. C.
July 1964. 25 p. (NASA-SP-7008).
A guideline is presented to insure the proper selection of size, shape, and style of illustrations for use in printed technical publications for NASA. The following areas are covered in detail: (1) materials; (2) graphs; (3) line drawings (4) perspective drawings; (5) typography and lettering; (6) photographs; (7) layouts; and (8) figuring reductions.

TECHNICAL INFORMATION BULLETIN
NASA, Scientific and Technical Information Division, Washington, D. C. Irregular, distributed to NASA personnel whose responsibilities lie within the scientific and technical information area.

TECHNICAL PUBLICATIONS ANNOUNCEMENTS (See further "Scientific and Technical Aerospace Reports")

Note: For NASA/NACA publications prior to Jan. 1962 see "Index of NASA Technical Publications."

Vol. 1 (covers Nov. 14, 1958-April 26, 1962; issues 1-70). Various titles; see note under entry for STAR.
Vol. 2 (covers January-December 1962)

X-15 RESEARCH RESULTS, WITH A SELECTED BIBLIOGRAPHY
W. H. Stillwell. NASA, Washington, D. C. 1965. 128 p. (NASA-SP-60).
GOP: $0.55

ISSUE 8 SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS Vol. 4 No. 8 APRIL 23, 1966 N66-17266—N66-18485

Scientific and Technical Aerospace Reports

A SEMIMONTHLY ABSTRACT JOURNAL WITH INDEXES

APRIL 23, 1966

VOLUME 4 • NUMBER 8

N66-17266—N66-18485

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA

Purchase of *STAR*

The semimonthly issues and the cumulative index issues are available postpaid on subscription and in single copy from the Superintendent of Documents, United States Government Printing Office, Washington, D.C., 20402, United States of America.

Semimonthly issues. Annual subscription rate: $33.00, domestic; $42.00, foreign. Price per single copy: $2.25, domestic; 25¢ extra for foreign mailing.

Cumulative index issues. Annual subscription rate: $30.00, domestic; $35.00, foreign. Price per single copy varies according to the number of pages.

Domestic subscription rates apply to the United States, Canada, Mexico, and all Central and South American countries, except as noted below.

Foreign subscription rates apply to Argentina, Brazil, British and French Guiana, Surinam, British Honduras, and all other countries throughout the world.

Payment should be by check, money order, or document coupons, and must accompany order. Remittances from foreign countries should be made by international money order, or draft on an American bank, payable to the Superintendent of Documents, or by UNESCO book coupons.

Published by:
United States Government
National Aeronautics and Space Administration
Scientific and Technical Information Division

Scientific and Technical Aerospace Reports, Volume 4, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Documentation Incorporated.

Use of funds for printing this publication approved by the Director of the Bureau of the Budget January 9, 1965

Introduction

What *STAR* Is

Scientific and Technical Aerospace Reports (STAR) is a comprehensive abstracting and indexing journal covering worldwide report literature on the science and technology of space and aeronautics. It is published twice each month.

Major areas covered in *STAR* are:

- Scientific and technical reports of the National Aeronautics and Space Administration and its contractors.
- Scientific and technical reports of government agencies, universities, and research organizations throughout the world.

How *STAR* Is Organized

The first section of *STAR*, arranged in 34 categories, contains abstracts and bibliographic citations (see p. vi). A second section consists of five indexes: subject, corporate source, author, report/accession number, and accession/report number. Separate cumulative indexes are published quarterly, except for the fourth quarter, which is an annual index. Cumulative indexes also contain a contract number index.

How to Use *STAR*

Readers are encouraged to examine the abstracts in each category of interest. If time is short, and when interest is concentrated in specific areas, readers may wish instead to scan source, author, and subject indexes. A more thorough coverage of a subject field may often be achieved by detailed examination of the subject listings, especially as they are cross-indexed in the quarterly indexes.

Availability of *STAR* and Documents

NASA documents (identified with an asterisk), as well as *STAR* itself, are available without charge to:

1. NASA Offices, Centers, contractors, subcontractors, grantees, and consultants.
2. Other U.S. Government agencies and their contractors.
3. Libraries in the United States that maintain collections of NASA documents for public reference.
4. Other organizations in the United States having a need for NASA documents in work related to the aerospace program.
5. Foreign government or academic (university) organizations that have established reciprocal arrangements for the exchange of publications with NASA, that have current agreements for scientific and technical cooperative activities with NASA, or that have agreements with NASA to maintain depositories of NASA documents for public use.

NASA documents identified with the symbol # have been placed on microfiche and are available in that form without charge to the organizations listed above.

Foreign non-copyrighted documents will be provided to U.S. Government Agencies and their contractors. AGARD reports that are not commercially available will also be provided by NASA to the domestic organizations listed above.

Other non-NASA documents are provided by NASA without charge only to NASA Offices, Centers, contractors, subcontractors, grantees, and consultants.

How to Request Listed Documents

If you are registered with NASA, send a completed *Document Request* (Facility Form 492) to:

NASA Scientific and Technical Information Facility
P.O. Box 33
College Park, Maryland 20740

If you are eligible to receive documents without charge (see previous page) but are not registered with NASA, request *Registration Form—Technical Publications* (NASA Form 439) from:

Scientific and Technical Information Facility
Attention: NASA Representative
P.O. Box 33
College Park, Maryland 20740

How the Public May Obtain Listed Documents

For reference purposes, NASA documents listed in *STAR* may be consulted at one of the organizations listed on the inside back cover. Commercial publications listed in *STAR* may usually be consulted in libraries or purchased from publishers or booksellers.

The public may purchase NASA documents and non-copyrighted foreign documents listed in *STAR* from either of two sales agencies, specifically identified in the abstract section:

- Clearinghouse for Federal Scientific and Technical Information (CFSTI), Springfield, Virginia 22151
- Superintendent of Documents (GPO), U.S. Government Printing Office, Washington, D.C. 20402

Documents available from the Clearinghouse for Federal Scientific and Technical Information are sold in hard-copy and microfiche form. If printed hard-copy is not available, a facsimile copy is provided. The symbols "HC" and "MF" are used in the abstract section to designate the copy available: "HC" (hard-copy) for full-size or facsimile; "MF" for microfiche. The price is also given. Following the availability information in the citation of each NASA-supported document is a code, e.g., CSCL 25A, indicating the subject category assigned to that document from the *COSATI Subject Category List* (first ed., December, 1964) published by the Committee on Scientific and Technical Information of the Federal Council for Science and Technology.

The public may request non-NASA documents by writing to the source, or other information systems. Identification other than the NASA accession number (N66-12345) should always be provided when requesting such a document from its source.

Abstracts of Journal Articles

By arrangement between NASA and the American Institute of Aeronautics and Astronautics, the AIAA publication *International Aerospace Abstracts* is issued in coordination with *STAR*. Each journal appears on alternate weeks. *IAA* uses identical subject categories with those in *STAR*, and publishes similar indexes. *IAA's* worldwide coverage of books and scientific and trade journals complements *STAR's* worldwide report coverage. The two publications thus provide comprehensive access to current literature on aerospace science and technology.

Organizations having a NASA contract may obtain *IAA* by writing NASA, Code USS-A, Washington, D.C., 20546. Others should direct inquiries to the American Institute of Aeronautics and Astronautics, 750 Third Avenue, New York, N.Y. 10017.

Table of Contents

Volume 4 Number 8 / April 23, 1966

Abstracts in the journal are grouped under the following categories: PAGE

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion. 1155

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics. 1158

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems. 1160

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology. 1170

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences. 1180

06 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants. 1185

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation. 1193

08 COMPUTERS

Includes computer operation and programming; and data processing. For basic research see: 19 Mathematics. 1196

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation. 1203

10 ELECTRONICS
Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see: Specific Physics Categories. **1208**

11 FACILITIES, RESEARCH AND SUPPORT
Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations. . . . **1209**

12 FLUID MECHANICS
Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion. **1213**

13 GEOPHYSICS
Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences. **1220**

14 INSTRUMENTATION AND PHOTOGRAPHY
Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras. **1231**

15 MACHINE ELEMENTS AND PROCESSES
Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control, reliability; drafting; and materials fabrication, handling, and inspection. **1237**

16 MASERS
Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State. **1247**

17 MATERIALS, METALLIC
Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics. **1247**

18 MATERIALS, NONMETALLIC
Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics. **1259**

19 MATHEMATICS
Includes calculation methods and theory; and numerical analysis. For applications see: 08 Computers. **1260**

20 METEOROLOGY
Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences. **1265**

21 NAVIGATION
Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications. **1267**

22 NUCLEAR ENGINEERING
Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems. **1268**

23 PHYSICS, GENERAL
Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology, and 29 Space Radiation. 1275

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR
Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation. 1282

25 PHYSICS, PLASMA
Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems. 1309

26 PHYSICS, SOLID-STATE
Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics. 1313

27 PROPELLANTS
Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems. 1318

28 PROPULSION SYSTEMS
Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants. 1319

29 SPACE RADIATION
Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics; and 24 Physics, Atomic, Molecular, and Nuclear. 1322

30 SPACE SCIENCES
Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles. 1324

31 SPACE VEHICLES
Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics. 1330

32 STRUCTURAL MECHANICS
Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic. 1332

33 THERMODYNAMICS AND COMBUSTION
Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants. 1341

34 GENERAL
Includes reports of a broad nature related to industrial applications and technology, and to basic research; defense aspects; law and related legal matters; and legislative hearings and documents. 1348

SUBJECT INDEX I-1

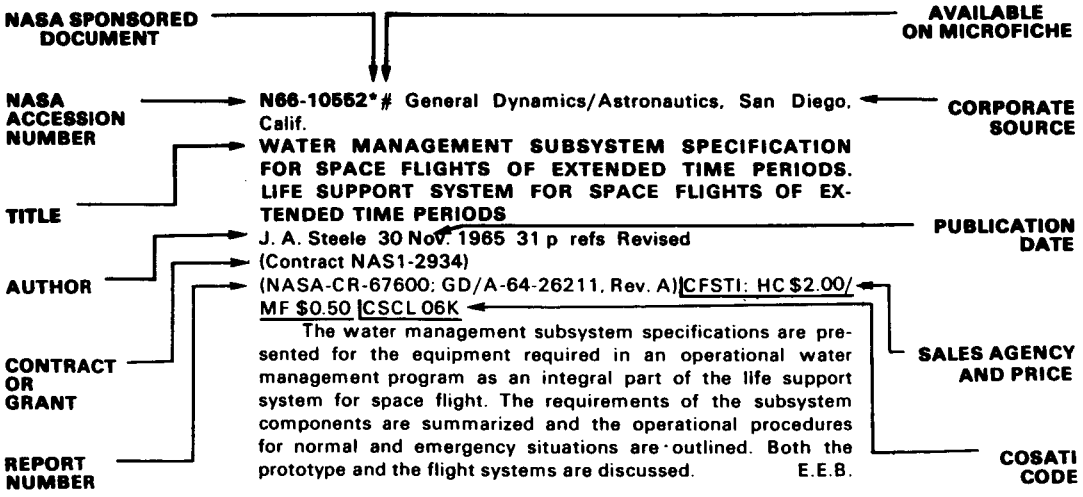
CORPORATE SOURCE INDEX I-71

PERSONAL AUTHOR INDEX I-87

REPORT/ACCESSION NUMBER INDEX I-117

ACCESSION/REPORT NUMBER INDEX I-127

TYPICAL CITATION AND ABSTRACT FROM *STAR*



VOLUME 4 NUMBER 8

Scientific and Technical Aerospace Reports

A Semimonthly Publication
of the National Aeronautics and Space Administration

April 23, 1966

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbo machinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N66-17366*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN ANALYSIS AND CORRELATION OF AIRCRAFT WAVE DRAG
Roy V. Harris, Jr. Washington, NASA, Mar. 1964 73 p refs
(NASA-TM-X-947) CFSTI: HC $3.00/MF $0.75 CSCL 01A
(Declassified)

A computer program, developed for use on the IBM 7090 electronic data processing system, has been studied. The results of this study indicate that, in addition to providing reasonably accurate supersonic wave-drag estimates, the computer program provides a useful tool which can be used in design studies and for configuration optimization. A detailed description of the program is given in the appendix. Author

N66-17428# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
A TWO DIMENSIONAL STATIC STABILITY THEORY FOR AN AIR CUSHION VEHICLE WITH A CENTRAL STABILITY JET
A. J. Burgess May 1964 116 p refs
(AASU-256) CFSTI: HC $4.00/MF $0.75

Two of the simple inviscid performance theories are extended to include the "underfed" and "split" jet conditions, and comparison with experimental evidence has enabled the most suitable to be chosen. Using the assumption that the cross flow is fully expanded in the cushion region, and neglecting the effects of flow separation and subsequent reattachment adjacent to a splitting jet, a simple two-dimensional stability theory is developed for two and three jet configurations. Results are compared with preliminary experimental evidence, and the theory is found to be suitable only for a limited range of three jet conditions. The dependence of the stability on the parameters hoverheight to craft length ($^{h^2}/_{l}$), hoverheight to jet thickness ($^{h^2}/_{t_1}$), edge jet angle (θ), center jet momentum, etc., is examined, and comparisons made between several methods of obtaining a stability margin at level trim.
Author

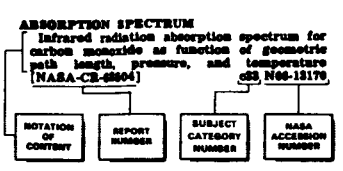
N66-17657# Wissenschaftliche Gesellschaft für Luft- und Raumfahrt, Cologne (West Germany).
REPORT ON THE MEETING OF THE FLIGHT MECHANICS TECHNICAL COMMITTEE [BERICHT UBER DIE SITZUNG DES FACHAUSSCHUSSES FLUGMECHANIK]
Jun. 1965 77 p In GERMAN Meeting held at Oberpfaffenhofen (W. Ger.), May 1964
(DLR-MITT.-65-04) CFSTI: HC $3.00/MF $0.75

A short report on the third international flight test instrumentation meeting in Cranfield, England, is followed by outlines of various test facilities and their instrumentation for evaluation of airplanes. A detailed description of the test facility instrumentation for checkout of the FOUGA CM 170 aircraft showed that it can register 23 analog measurements simultaneously by oscillograph. The test facility at the EWR airplane factory employs hybrid measuring techniques that combine photoregistration with telemetric transmission to obtain airplane performance parameters. Transl. by G.G.

N66-17888*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AERODYNAMIC CHARACTERISTICS OF A 0.0667-SCALE MODEL OF THE X-15A-2 RESEARCH AIRPLANE AT TRANSONIC SPEEDS
James C. Patterson, Jr. Washington, NASA, Mar. 1966 76p refs
(NASA-TM-X-1198) CFSTI: HC $3.00/MF $0.75 CSCL 01A

An experimental investigation has been conducted in an 8-foot transonic pressure tunnel of a 0.0667-scale model of a modified version of the X-15 research airplane at Mach numbers from 0.60 to 1.20, over an angle-of-attack range from approximately −4° to 20°, and at Reynolds numbers based on the mean geometric chord from 2.074×10^6 to 2.172×10^6. The results indicate that the static longitudinal, directional, and lateral stability of the configuration, less the externally mounted fuel tanks, has been reduced at lifting conditions compared with that of the X-15 research airplane. The addition of the externally mounted fuel tanks resulted in a reduction in the longitudinal and directional stability such that the configuration was longitudinally unstable at zero lift below a Mach number of 1.10 and directionally unstable or neutrally stable at a higher angle of attack of 16°. The effective dihedral was increased by the addition of the tanks except for an angle of attack of 16° at Mach numbers ranging from 0.60 to 0.90.
Author

LISTING OF REPORTS BY SUBJECT



The Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The report number helps to indicate the type of document cited. The subject category number and the accession number are included to assist in locating the abstract in the abstract section of *STAR*.

A

ABLATING MATERIAL
Teflon and high density phenolic-nylon models evaluated at various enthalpies and heating rates under supersonic conditions
[NASA-CR-379] c33 N66-17891
Evaluation and erosion of nonmetallic ablating materials as rocket nozzle sections
[NASA-TN-D-3258] c18 N66-18312

ABSORPTION
Theory-experiment comparison of plutonium 240 resonance absorption for reactor fuel use
[BNWL-97] c24 N66-17501
Atmospheric scattering function determination for light allowing for multiple scattering and pure absorption c13 N66-17753

ABSORPTION COEFFICIENT
Source temperatures effects on atmospheric surface layer long wave radiation absorption coefficient measurements c13 N66-17755

ABSORPTION CROSS SECTION
Thermal and resonance neutron absorption cross section measurements for gross fission products of uranium 233 and 235, and plutonium 239
[AECL-2510] c24 N66-18418

ABSORPTION SPECTRUM
Lower atmosphere absorption spectrum structure from 8512 to 11600 A - neodymium laser spectrum
[NRL-6353] c13 N66-17604
Molecular oxygen density measurements in upper atmosphere by absorption spectroscopy using solar Lyman alpha radiation
[NASA-CR-392] c13 N66-17895

ABSTRACT
Welding methods bibliography with abstracts, and subject and author indices
[NASA-SP-5024] c15 N66-17377
Annotated bibliography on solid lubricants - with indexes
[NASA-SP-5037] c15 N66-17358
Annotated bibliography on applications of electromechanical transducers - with indexes
[NASA-SP-5036] c09 N66-17359
Abstracted reports from conference on stratosphere and mesosphere meteorology c20 N66-17738
Abstracts of scientific and technical reports in physics, chemistry, engineering, life sciences, and mathematics - bibliography
[AFOSR-700-III] c34 N66-18062
Bibliography and abstracts on hydrated actinide oxide sols and uranium hydrolysis reactions
[ORNL-TM-1052] c06 N66-18285
Organic systems and biogenesis - abstracts
[NASA-TT-F-9863] c04 N66-18448

ACCELERATION
Vibration tests on Ranger spacecraft with single point control of input vibratory accelerations c32 N66-17900

ACCELERATOR
Electrical conductivity, electrode temperature, and potential distribution measurements for argon atmospheric pressure Faraday accelerator
[D1-82-0486] c25 N66-17637
Performance characteristics of intersecting storage rings and tangent accelerators
[CERN-65-39] c24 N66-17687

ACCELEROMETER
Design, fabrication, and testing of miniature digital electrostatic accelerometer for low gravity measurements in space
[NASA-CR-54127] c14 N66-18018

ACCIDENT PREVENTION
SL-1 boiling water reactor accident assessed for developing model scale techniques for evaluating safety of water reactors
[AWRE-R-3/65] c22 N66-18035

ACETAL
Mechanical behavior and time temperature strain rate equivalence for acetal, polycarbonate, polyamide, and fluorocarbon
[NASA-TM-X-56366] c18 N66-18377

ACETIC ACID
Radio-chemical carboxylation of polychloride compounds to trichloride acetic acid
[SGAE-CH-25/1965] c06 N66-18090

ACOUSTIC FATIGUE
Fatigue test review on acoustic fatigue, plastic deformation, structural fatigue, supersonic transport materials, crack propagation and detection
[NASA-TM-X-56562] c17 N66-18359

ACOUSTIC RADIATION
Normal phase and diurnal variations of very low frequency radiation transmitted from Panama to Alaska
[TN-206-4] c13 N66-17268

ACOUSTIC SIMULATION
Extensive vibration measurements from ground test acoustic simulations of Ranger spacecraft launch, and transonic vibration excitation modes c32 N66-17791

ACOUSTICS
Broadband fluid amplification at acoustic frequencies c12 N66-17822

ACTINIDE
Bibliography and abstracts on hydrated actinide oxide sols and uranium hydrolysis reactions
[ORNL-TM-1052] c06 N66-18285

ACTUATOR
Roller drum, actuation system, support structure, electrical provisions, and substrate design concepts for deployable large area solar array structure
[NASA-CR-70377] c32 N66-17356
Conference on lubrication techniques and seal design for orbital manned space laboratory door actuator
[AD-623336] c15 N66-17440
Dynamic and static fluid seals for door activators c15 N66-17442
Solid lubrication of manned orbital space station door activator c15 N66-17443

ADAPTIVE CONTROL SYSTEM
Bounded control of unstable mechanical systems - bang-bang control
[SUDAER-223] c23 N66-17360

ADDITIVE
Increasing critical current density of hard superconducting alloys by using additives
[AI-TRANS-97] c17 N66-17543

ADHESIVE
Adhesive and surface finish effects on magnesium alloy bond strength
[BDX-613-68] c17 N66-17530

ADRENAL GLAND
Role of pituitary and adrenal glands in genesis of and recovery from radiation pathological symptoms
[JPRS-34120] c04 N66-17623

ADSORPTION
Beryllium adsorption on ion exchange resins from fluoride, phosphate, carbonate, and thiocyanate compounds
[AAEC/E-136] c06 N66-17516
Electrocapillary phenomena and adsorption of surface-active agents on clean liquid gallium
[IS-TRANS-17] c26 N66-18234
Chromatographic apparatus using adsorption of gas mixture on activated charcoal
[NASA-TT-F-9875] c06 N66-18451

AERIAL PHOTOGRAPHY
Aerial photographic analysis of dye tracer response to ocean surface and wind effects
[CU-22-65] c13 N66-17496

AERODYNAMIC CHARACTERISTICS
Atmospheric turbulence and diffusion downwind of large reactor complex due to aerodynamic characteristics of structures
[IDO-12041] c11 N66-17830
Aerodynamic characteristics of scale model of X-15 research aircraft determined in transonic pressure tunnel
[NASA-TM-X-1198] c01 N66-17888
Full-scale wind tunnel
[NASA-TN-D-3330] c01 N66-17905

AERODYNAMIC STABILITY
Two-dimensional inviscid flow theory for air cushion vehicle with central stability jet
[AASU-256] c01 N66-17426
Aerodynamically stable meteorological balloon sensor development for determination of vertical wind velocity profiles c14 N66-17729

AERODYNAMICS
Vortex theory generalization for lifting screw blade surface c12 N66-17412
Aerodynamics research and high speed, high temperature flow problems
[D1-82-0456-1] c11 N66-17631

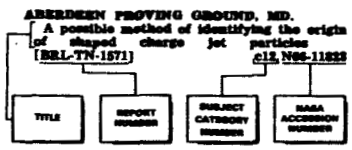
AEROSOL
Tracer system using aerosol generator and high volume sampler for filter flow detection
[BMI-X-346] c06 N66-17536
Atmospheric refraction, extinction, and aerosol effects on astrophysical observations including significance of surface reflectance and high altitude-cosmic dust c13 N66-17747
Aerosol optical properties calculation based on particle size distribution function density c23 N66-17760
Aerosol sampling device for curvilinear streams, and method for determining sample probability distribution functions c13 N66-17761
Twilight photometric observations of earth upper atmosphere for study of density distributions, aerosol particles, and luminescences c13 N66-17771

AEROSPACE MEDICINE
Research in exobiology, environmental biology, behavioral biology, molecular biology and bioinstrumentation, space flight programs, and manned space flight

CORPORATE SOURCE INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 4, NUMBER 8

LISTING OF REPORTS BY SOURCE



The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited. The subject category number and the accession number are included to assist in locating the abstract in the abstract section of *STAR*.

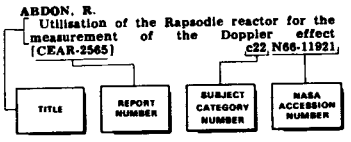
A

ACADEMIA R. P. R., BUCHAREST /ROMANIA/.
Correction of intensities of diffraction maxima for absorption in cylindrical samples
[IFA-FN-36] c23 N66-17629
Interaction mean free path of 9 GeV/c negative pions in xenon
[IFA-CR-51] c24 N66-17676
Angular distribution of neutrons from the Mn55/alpha,n/Co58 reaction at E alpha equals 14 and 17 MeV
[IFA-CRD-90] c24 N66-17922
On the measurement of Coulomb scattering in the presence of track distortion and spurious scattering
[IFA-CR-52] c24 N66-17900
The study of ESR signal of active chars in oxygen atmosphere
[IFA-IS-31/19657] c24 N66-17923
AEROJET-GENERAL CORP., COVINA, CALIF.
Recommended cooldown procedures for E-zone cryogenic piping systems
[NASA-CR-70517] c23 N66-18162
AEROJET-GENERAL CORP., SACRAMENTO, CALIF.
Development of large size bellows face type seals for liquid oxygen and oxygen/hydrogen hot gas service at moderate to high pressures
[NASA-CR-54818] c15 N66-17285
Commerical application of rocket engine turbopump technology c26 N66-17700
Valve lipseals M-1 sleeve-type thrust chamber valve
[NASA-CR-54806] c15 N66-18434
Mechanical design of the M-1 axial flow liquid hydrogen fuel pump
[NASA-CR-54823] c15 N66-18435
Design and development of liquid hydrogen cooled 120mm roller, 110mm roller, and 110mm tandem ball bearings for M-1 fuel turbopump
[NASA-CR-54826] c15 N66-18485
AERONAUTICAL CHART AND INFORMATION CENTER, ST. LOUIS, MO.
Kursk magnetic anomalies
[TC-903] c13 N66-17610
AERONAUTICAL RESEARCH COUNCIL /GT. BRIT./
On the calculation of cascade flows
[ARC-CP-806] c12 N66-17446
AEROPROJECTS, INC., WEST CHESTER, PA.
Applications of ultrasonic energy
Ultrasonic instrumentation for nuclear applications Bimonthly progress report no. 20, 1 Dec. 1964 - 31 Jan. 1965
[NYO-3910-8] c23 N66-18305
AEROSPACE MEDICAL DIV. AEROSPACE MEDICAL RESEARCH LABS. /6570TH/, WRIGHT-PATTERSON AFB, OHIO.
Zero-g studies and pressure suits c05 N66-17388
Research on use of computers for handling advanced systems human factors task data Quarterly status report, 1 Oct. - 31 Dec. 1965
[NASA-CR-70513] c05 N66-18161
AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
Analysis of the response of a nonlinear differential equation to white random excitation
[GE/EE/65-14] c10 N66-17602
AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Progress on cadmium telluride thin film solar cells c03 N66-17327
Herald of Leningrad University, no. 13, Mathematics, Mechanics, and Astronomy Series, issue 3, 1963
[FTD-MT-64-249] c23 N66-17406
Conditions of uniqueness and estimations of the solution of Dirichlet's problem c23 N66-17407
Approximation of a function with a given stochastic argument c19 N66-17408
On propagation of complex functions c19 N66-17409
Asymptotic formulas for coefficients of exchange by momentum and energy on the surface of a body around which rarefied gas is flowing c12 N66-17410
A general formulation of problems on the description of relaxation processes in gases with internal degrees of freedom c12 N66-17411
The theory of a supporting screw surface c12 N66-17412
Diffusion of radiation in a semi-infinite medium during anisotropic scattering, II c29 N66-17413
Self-alignment and balancing of coaxial rotors
[FTD-TT-64-75/1+2] c28 N66-17414
Surfaces whose plane sections are composed of convex parts c23 N66-17415
Increase in norm LP and Orlich spaces c19 N66-17416
On algebraic approximations in the field of power series c19 N66-17417
On the reliability of single-cycle circuits built from elements with symmetric errors c10 N66-17418
Condition of embedding in the case of cyclical normal divisor of order 2n c19 N66-17419
On base pressure for solids of revolution in a supersonic gas flow
[FTD-TT-63-1146/1+2] c12 N66-17420
Qualitative investigation of a certain nonlinear system of two differential equations c19 N66-17421
On estimates of intensities of emission lines N III in spectra of stars c30 N66-17422
On more precise definition of the spectral pattern N III, utilized for calculation of its recombination spectrum in shells of stars and nebulae, X c30 N66-17423
On proof of the basic hypotheses in multi-dimensional analysis c19 N66-17424
Journal of Astronomy Selected articles
[FTD-TT-64-1237/1+2+3+4] c30 N66-17455
Observation error analysis of photoelectric transit instrument c30 N66-17456
Investigation of the photometric properties of the 15-cm refractor of the Purple Mountain Observatory - The effect of focusing in the- regions of chromatic aberration c30 N66-17457
Perturbation equation of vector elements c30 N66-17458
News of schools of higher education. Mathematics Selected articles
[FTD-TT-65-981/1+2] c23 N66-17466
On the possible form of a general solution to equilibrium equations in curvilinear coordinates c23 N66-17467
Cavitational flow past a flat plate c12 N66-17468
Annular combustion chamber of a low-power gas turbine engine
[FTD-TT-65-964/1+2+4] c26 N66-17508
Studying the effect of change in thickness of a rectangular plate in plan into basic frequency of lateral oscillations
[FTD-TT-65-1037/1+4] c22 N66-17626
Systematic analysis of some results obtained from aerodynamic testing of two-dimensional turbine stages at low speed
[FTD-TT-64-1000/1+2+3+4] c26 N66-18104
AIRCRAFT RESEARCH ASSOCIATION, LTD., BEDFORD /ENGLAND/.
Guide to the A.R.A. 16 in times 12 in Mach 4 and 12 in diameter Mach 7 blowdown wind tunnels c11 N66-17307
The use of a twin-sting model support system to determine the effects of rear fuselage distortion c11 N66-18049
AIRESEARCH MFG. CO., LOS ANGELES, CALIF.
Parametric design study - Recuperator development program, solar Brayton cycle system
[NASA-CR-70361] c03 N66-17325
AKTIEBOLAGET ATOMENERGI, STOCKHOLM /SWEDEN/.
Methods for the determination of currents and fields in steady two-dimensional MHD flow with tensor conductivity
[AE-210] c25 N66-17402
Measurement of the neutron slowing-down time distribution at 1.46 eV and its space dependence in water
[AE-208] c24 N66-17403
On the use of importance sampling in particle transport problems
[AE-190] c24 N66-17496
Measured and predicted variations in fast neutron spectrum when penetrating laminated Fe-D2O
[AE-196] c24 N66-17542
Incompressible steady flow with tensor conductivity leaving a transverse magnetic field
[AE-209] c25 N66-17656
Experimental studies on assemblies 1 and 2 of the fast reactor FRO, part 2
[AE-207, PT. 2] c22 N66-17665
Energy dependent removal cross-sections in fast neutron shielding theory
[AE-184] c24 N66-17885
Systematics of absolute gamma ray transition probabilities in deformed odd-A nuclei
[AE-205] c24 N66-18116
Report on the personnel dosimetry at AB Atomenergi during 1964
[AE-211] c04 N66-18123
Burnout data for flow of boiling water in vertical round ducts, annuli and rod clusters
[AE-177] c33 N66-18301
Neutron-activation analysis of natural water applied to hydrogeology
[AE-204] c13 N66-18417

PERSONAL AUTHOR INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 4, NUMBER 8

LISTING OF REPORTS BY AUTHOR



The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited. The subject category number and the accession number are included to assist in locating the abstract in the abstract section of *STAR*.

A

AALTO, E. J.
Measured and predicted variations in fast neutron spectrum when penetrating laminated Fe-D2O
[AE-196] c24 N66-17542

ABAR, J. W.
Fluid seals c15 N66-17442

ABBOTT, M. R.
Axially symmetric steady motion of a viscous incompressible fluid. Some numerical experiments
[RAE-TN-MATH-96] c12 N66-18400

ABBOTT, R. P.
Octopus/6600 users' manual
[UCRL-12256] c08 N66-17994

ABDUMALIKOV, A. A.
New data on 135Ce decay
[JINR-P-2235] c24 N66-17991
Spectra of conversion electrons of Ce-133 andCe-132 isotopes
[JINR-P-2236] c24 N66-18280

ABDURAZAKOV, A. A.
New data on 135Ce decay
[JINR-P-2235] c24 N66-17991
Spectra of conversion electrons of Ce-133 andCe-132 isotopes
[JINR-P-2236] c24 N66-18280

ABEN, KH. K.
Optical phenomena in photoelastic coatings in the investigation of shells
[NASA-TT-F-9879] c32 N66-18452

ABRAHAMSON, L. P.
Two-body linear guidance matrices
[NASA-CR-70465] c30 N66-17469

ABRAMSON, H. N.
Further studies of liquid sloshing in rocket propellant tanks. Final report, 25 Mar. 1961 - 31 Dec. 1965
[NASA-CR-70514] c32 N66-18414

ABREU, M.
Total neutron cross sections of praseodymium, ytterbium, lutetium and erbium
[IEA-86] c24 N66-17962

ABSTEIN, H. T.
On the use of multiple /multi-point/ random excitation with application to Surveyor spacecraft tests c32 N66-17790

ACCARY, A.
Variations of the uranium monocarbide parameter with changes in the carbon content
[CEA-R-2731] c26 N66-17973

ACKERMAN, C. E.
An analysis of digital range trackers
[TG-717] c07 N66-17594

ACTON, C. V.
An atlas of the absorption of the atmosphere from 8512 to 11,600A
[NRL-6352] c13 N66-17604

ADAMS, E. W.
An explanation of tektite chemistry in terms of lunar ash flows
[NASA-TM-X-56128] c13 N66-18388

ADDISS, E. R.
GaAs thin film solar cells c03 N66-17328

ADELL, M. R.
Direct-reading spectrochemical analysis of magnesium alloys
[JEN-146-DQ/I-47] c06 N66-18251
Direct-reading spectrochemical analysis of nuclear graphite
[JEN-145-DQ/I-46] c06 N66-18262

ADEY, W. R.
Comprehensive spectral analysis of human EEG generators in posterior cerebral regions
[NASA-CR-57050] c04 N66-18389

AEBY, J. W.
Beta-gamma radioactivity in environmental air at Los Alamos, New Mexico, for 1964
[LA-3245-MS] c24 N66-18300

AFANASYEV, V. N.
A class of standard operators for economic problem oriented computer systems, I c08 N66-17378

AGRICOLA, K. R.
Development of explosive forming techniques for Saturn V components. Final report, 24 Jun. 1964 - 28 Jan. 1966
[NASA-CR-70568] c15 N66-18408

AKHMANOV, E. A.
Distortion of unmodulated electromagnetic waves in nonlinear dispersing media. Generation of optical harmonics
[JPRS-34251] c23 N66-18100

AKYEAMPONG, D. A.
Baryon octet scattering in U/12/
[IC/65/65] c24 N66-18235

AKYUZ, O.
Crystal spectrometer measurement of Cekmece TR-1 Thermal Neutron Spectrum
[CNAEM-19] c22 N66-18102

AL TSHUL, L. M.
Theory of nonlinear oscillations in a collisionless plasma
[NASA-TT-F-10015] c25 N66-18455

ALBERT, R. C.
Neon-hydrogen bubble chambers
[BNL-9425] c11 N66-17489

ALDRIDGE, E. E.
A control engineering approach to magnetohydrodynamic stability
[CLM-P-69] c25 N66-18043

ALEKSANDROV, A. D.
Conditions of uniqueness and estimations of the solution of Dirichlet's problem c23 N66-17407

ALEVRA, A.
Angular distribution of neutrons from the Mn55/alpha,n/Co58 reaction at E alpha equals 14 and 17 MeV
[IFA-CRD-30] c24 N66-17922

ALEXANDER, E. G.
Development of epitaxial structures for radiation resistant silicon solar cells c03 N66-17308

ALFIMENKOV, V. P.
Determination of spins of Ho165 neutron resonances by transmission of polarized neutrons through a polarized target in the energy interval 0-55 ev
[JINR-P-2209] c24 N66-18200

ALGER, D. L.
Thermal neutron flux perturbation by dysprosium-aluminum foils in water and uranyl fluoride - water solutions
[NASA-TN-D-3237] c22 N66-17663

ALKSNE, A. Y.
Hydromagnetic flow around the magnetosphere
[NASA-TM-X-56548] c13 N66-18351

ALLEN, G.
Magnetic breakdown in a finite one-dimensional model - infinite potential relaxed
[NASA-TN-D-3224] c23 N66-18167

ALLEN, R. W.
The thin film thermometer as a triggering and measuring device in a shock tube
[AWRE-O-56/65] c14 N66-17541

ALTEROVITZ, S.
Calculation of gamma ray energy response for a flat silver metaphosphate glass dosimeter
[IA-1003] c24 N66-18237

ALVAREZ, R.
Accuracy of solution X-ray spectrometric analysis of copper-base alloys. Standard reference materials
[NBS-MISC.-PUBL.-260-5] c06 N66-17659

AMARAL, L. Q.
Total neutron cross sections of praseodymium, ytterbium, lutetium and erbium
[IEA-86] c24 N66-17962

AMBURGEY, J. W., JR.
Systems combining continuous-flow and density gradient centrifugation, models B-VIII and B-IX
[K-L-2012] c22 N66-17864

AMILANI, A.
Sealing factors - Their measurement and use in the design of vacuum gasket seals
[CONF-650643-1] c15 N66-18211

ANDELIN, R. L.
High-temperature compatibility testing of molten plutonium fuel-container systems
[LA-DC-7315] c17 N66-18390

ANDERSON, A. F.
Parametric design study - Recuperator development program, solar Brayton cycle system
[NASA-CR-70381] c03 N66-17325

ANDERSON, J.
Measurement of cortical bone volume and lumbar spine density c04 N66-17669
The application of measurements of bone volume and spinal density c04 N66-17681

ANDERSSON, T. L.
Experimental studies on assemblies 1 and 2 of the fast reactor FRO, part 2
[AE-207, PT. 2] c22 N66-17665

ANGELE, W.
Flat conductor wiring systems for federal and commercial applications c15 N66-17727

APELT, A. O.
NASA's spacecraft battery evaluation program
[NASA-TM-X-56176] c03 N66-18341

ARF, C.
On the Galois group structure of the algebraic closure of a power series field over a finite field and the Artin conductors
[CNAEM-15] c19 N66-18148

ARIAS, A.
Investigation of physical properties affecting thermal shock resistance of zirconia with 15 mole percent titanium
[NASA-TM-X-56320] c17 N66-18382
Investigation of the mechanism by which metal additions improve the thermal shock resistance of zirconia
[NASA-TM-X-56318] c17 N66-18383

ARMSTRONG, G. T.
Survey of thermodynamic properties of the compounds of the elements CHNOPS. Sixth preliminary report, 1 Oct. - 31 Dec. 1965
[NASA-CR-70464] c06 N66-17478

REPORT/ACCESSION NUMBER INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 4 NUMBER 8

Listing of Report Numbers

To the right of each report number is the NASA accession number, followed by an asterisk if the report is NASA sponsored (See Introduction for availability information). A # indicates the report has been microficheo. Preceding the accession number is a category number for locating the abstract. The Table of Contents identifies the subject material covered by each category.

A-38 ..... c25 N66-17353*#
A-098 ..... c32 N66-18081 #

AAEC/E-136 ..... c06 N66-17516 #

AAEC/TM-270 ..... c24 N66-17531 #

AASU-256 ..... c01 N66-17428 #

AASU-TN-258 ..... c02 N66-17648 #

AD-431682 ..... c07 N66-17430 #
AD-444380 ..... c04 N66-17644 #
AD-464401 ..... c01 N66-18405 #
AD-469576 ..... c09 N66-17299 #
AD-472422 ..... c30 N66-17455 #
AD-473296 ..... c12 N66-17384 #
AD-473377 ..... c07 N66-18137 #
AD-473814 ..... c33 N66-17298 #
AD-475044 ..... c32 N66-17628 #
AD-475120 ..... c11 N66-18424 #
AD-475424 ..... c28 N66-18104 #
AD-475570 ..... c17 N66-17654 #
AD-476160 ..... c27 N66-18098 #
AD-476189 ..... c32 N66-18401 #
AD-602827 ..... c08 N66-17591 #
AD-603782 ..... c06 N66-17590 #
AD-613592 ..... c08 N66-17692 #
AD-614694 ..... c27 N66-17589 #
AD-620546 ..... c06 N66-17592 #
AD-621776 ..... c28 N66-17593 #
AD-622491 ..... c32 N66-17609 #
AD-623142 ..... c03 N66-17431 #
AD-623144 ..... c26 N66-17607 #
AD-623248 ..... c15 N66-17611 #
AD-623336 ..... c15 N66-17440 #
AD-623404 ..... c23 N66-17321*#
AD-623424 ..... c13 N66-17610 #
AD-623455 ..... c12 N66-17808 #
AD-623642 ..... c23 N66-17406 #
AD-623889 ..... c18 N66-17612 #
AD-623973 ..... c07 N66-17594 #
AD-624197 ..... c32 N66-17296 #
AD-624257 ..... c15 N66-17597 #
AD-624262 ..... c15 N66-17601 #
AD-624268 ..... c19 N66-17286 #
AD-624286 ..... c16 N66-17361 #
AD-624294 ..... c13 N66-17603 #
AD-624295 ..... c09 N66-17600 #
AD-624311 ..... c11 N66-17596 #
AD-624323 ..... c13 N66-17604 #
AD-624396 ..... c24 N66-17599 #
AD-624426 ..... c19 N66-17586 #
AD-624427 ..... c26 N66-17588 #
AD-624478 ..... c07 N66-17595 #
AD-624500 ..... c19 N66-17287 #
AD-624530 ..... c26 N66-17605 #
AD-624562 ..... c26 N66-17292 #
AD-624583 ..... c09 N66-17293 #
AD-624595 ..... c18 N66-17608 #
AD-624616 ..... c05 N66-17587 #
AD-624618 ..... c23 N66-17360 #
AD-624762 ..... c28 N66-17305 #
AD-624837 ..... c19 N66-17362 #
AD-624842 ..... c10 N66-17602 #
AD-624851 ..... c23 N66-17466 #
AD-624927 ..... c25 N66-17598 #

ANS-16 ..... c02 N66-17396 #

AE-177 ..... c33 N66-18301 #
AE-184 ..... c24 N66-17885 #
AE-190 ..... c24 N66-17486 #
AE-196 ..... c24 N66-17542 #
AE-204 ..... c13 N66-18417 #
AE-205 ..... c24 N66-18116 #
AE-207, PT. 2 ..... c22 N66-17665 #
AE-208 ..... c24 N66-17403 #
AE-209 ..... c25 N66-17656 #
AE-210 ..... c25 N66-17402 #
AE-211 ..... c04 N66-18133 #

AEC-TR-6468 ..... c24 N66-18113 #
AEC-TR-6570 ..... c06 N66-17519 #
AEC-TR-6597 ..... c24 N66-17524 #

AECD/TP/4 ..... c24 N66-17505 #

AECL-2509 ..... c08 N66-18445 #
AECL-2510 ..... c24 N66-18418 #

AED-R-2565 ..... c31 N66-17585*#
AED-R-2817 ..... c03 N66-17349*

AEEW-M-493 ..... c22 N66-17460 #

AEEW-R-304 ..... c33 N66-17532 #

AERE-L-166 ..... c06 N66-17363 #

AERE-M-1389 ..... c22 N66-17498 #
AERE-M-1491 ..... c11 N66-17928 #
AERE-M-1561 ..... c22 N66-17266 #
AERE-M-1641 ..... c24 N66-18111 #

AERE-R-4895 ..... c14 N66-17565 #
AERE-R-4960 ..... c05 N66-18214 #
AERE-R-4980 ..... c22 N66-18119 #
AERE-R-4985 ..... c06 N66-18056 #
AERE-R-5009 ..... c24 N66-17538 #
AERE-R-5012 ..... c06 N66-17919 #
AERE-R-5019 ..... c10 N66-17660 #
AERE-R-5035 ..... c17 N66-17652 #
AERE-R-5045 ..... c17 N66-18048 #
AERE-R-5049 ..... c26 N66-17655*#

AERE-TRANS-1035 ..... c17 N66-17937 #

AFAPL-TR-65-28 ..... c27 N66-17589 #

AFOSR-65-1712 ..... c19 N66-17286 #
AFOSR-700-III ..... c34 N66-18062 #
AFOSR-2531 ..... c26 N66-17292 #

ACCESSION/REPORT NUMBER INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 4 NUMBER 8

Listing of Accession Numbers

This list of NASA accession numbers may be used to locate the subject category in which a specific abstract appears in this journal, as well as to identify the accessioned report. Accession numbers are arranged in ascending order, followed by an asterisk if the report is NASA sponsored (See Introduction for availability information). A # indicates the report has been microfiched. Preceding each accession number is a category number for locating the abstract in *STAR*. The Table of Contents identifies the subject material covered by each category. Report numbers are given for cross-reference purposes at the right side of each column.

c22 N66-17266 # AERE-M-1561
c30 N66-17267 # STL-9851-173
c13 N66-17268 # TN-206-4
c33 N66-17269 # JPRS-34062
c02 N66-17270 # ..... NO REPORT NUMBER
c04 N66-17271*# NASA-CR-70394
c04 N66-17272*# NASA-CR-70393
c04 N66-17273*# NASA-CR-70384
c15 N66-17274*# NASA-CR-70397
c29 N66-17275 # ..... SAO SPECIAL REPT.-196
c08 N66-17276*# NASA-CR-70398
c15 N66-17277*# NASA-SP-5024
c30 N66-17278*# NASA-CR-66038
c14 N66-17279*# NASA-CR-54468
c31 N66-17280*# NASA-CR-66044
c26 N66-17281*# NASA-CR-54704
c32 N66-17282*# NASA-CR-66059
c09 N66-17283*# NASA-CR-65213
c09 N66-17284*# NASA-CR-65214
c15 N66-17285*# NASA-CR-54818
c19 N66-17286 # AFOSR-65-1712
c19 N66-17287 # ONR-2
c19 N66-17288 # ..... NO REPORT NUMBER
c31 N66-17289*# NASA-CR-70178
c11 N66-17290*# NASA-CR-70165
c16 N66-17291*# NASA-CR-68895
c26 N66-17292 # AFOSR-2531
c09 N66-17293 # QPR-16
c07 N66-17294 # NBS-MONOGRAPH-80
c02 N66-17295 # ..... NO REPORT NUMBER
c32 N66-17296 # N-750
c05 N66-17297 # AM-65-14
c33 N66-17298 # AD-473814
c09 N66-17299 # T5-1559/3111
c11 N66-17300 # D1-82-0380-2
c12 N66-17301 # ..... NO REPORT NUMBER
c24 N66-17302 # EUR-2632.D
c26 N66-17303*# NASA-CR-69816
c30 N66-17304 # ..... NO REPORT NUMBER
c28 N66-17305 # USAAVLABS-TR-64-68C
c03 N66-17306*# NASA-CR-70168
c03 N66-17307* ..... NO REPORT NUMBER
c03 N66-17308* ..... NO REPORT NUMBER
c03 N66-17309* ..... NO REPORT NUMBER
c03 N66-17310* ..... NO REPORT NUMBER
c03 N66-17311* ..... NO REPORT NUMBER
c03 N66-17312* ..... NO REPORT NUMBER
c03 N66-17313* ..... NO REPORT NUMBER
c03 N66-17314* ..... NO REPORT NUMBER
c03 N66-17315* ..... NO REPORT NUMBER
c03 N66-17316* ..... NO REPORT NUMBER
c03 N66-17317* ..... NO REPORT NUMBER
c03 N66-17318* ..... NO REPORT NUMBER
c13 N66-17319*# NASA-CR-70389
c24 N66-17320*# NASA-CR-70391
c23 N66-17321*# NASA-CR-70392
c17 N66-17322*# NASA-CR-70396
c07 N66-17323*# NASA-CR-70395
c08 N66-17324*# NASA-CR-70399
c03 N66-17325*# NASA-CR-70381
c03 N66-17326*# NASA-CR-70169
c03 N66-17327* ..... NO REPORT NUMBER
c03 N66-17328* ..... NO REPORT NUMBER
c03 N66-17329* ..... NO REPORT NUMBER
c03 N66-17330* ..... NO REPORT NUMBER
c03 N66-17331* ..... NO REPORT NUMBER
c03 N66-17332* ..... NO REPORT NUMBER
c03 N66-17333* ..... NO REPORT NUMBER
c03 N66-17334* ..... NO REPORT NUMBER
c03 N66-17335*. ..... NO REPORT NUMBER
c03 N66-17336* ..... NO REPORT NUMBER
c03 N66-17337* ..... NO REPORT NUMBER
c03 N66-17338* ..... NO REPORT NUMBER
c03 N66-17339* ..... NO REPORT NUMBER
c03 N66-17340* ..... NO REPORT NUMBER
c09 N66-17341*# NASA-CR-70382
c02 N66-17342*# NASA-CR-70383
c15 N66-17343*# NASA-CR-70385
c31 N66-17344*# NASA-CR-70386
c13 N66-17345*# NASA-CR-70387
c03 N66-17346*# NASA-CR-70170
c03 N66-17347* ..... NO REPORT NUMBER
c03 N66-17348* ..... NO REPORT NUMBER
c03 N66-17349* AED-R-2817
c03 N66-17350* ..... NO REPORT NUMBER
c03 N66-17351* ..... NO REPORT NUMBER
c03 N66-17352* ..... NO REPORT NUMBER
c25 N66-17353*# NASA-CR-70388
c29 N66-17354*# NASA-CR-70375
c15 N66-17355*# NASA-CR-70376
c32 N66-17356*# NASA-CR-70377
c15 N66-17357*# NASA-CR-70378
c15 N66-17358*# NASA-SP-5037
c09 N66-17359*# NASA-SP-5036
c23 N66-17360 # SUDAER-223
c16 N66-17361 # HDL-TM-65-41
c19 N66-17362 # CS-29
c06 N66-17363 # AERE-L-166
c21 N66-17364 # SRDS-65-114
c01 N66-17365*# NASA-TM-X-947
c08 N66-17366 # JPRS-33371
c10 N66-17367 ..... NO REPORT NUMBER
c08 N66-17368 ..... NO REPORT NUMBER
c19 N66-17369 ..... NO REPORT NUMBER
c08 N66-17370 ..... NO REPORT NUMBER
c19 N66-17371 ..... NO REPORT NUMBER
c19 N66-17372 ..... NO REPORT NUMBER
c08 N66-17373 ..... NO REPORT NUMBER
c08 N66-17374 ..... NO REPORT NUMBER
c19 N66-17375 ..... NO REPORT NUMBER
c19 N66-17376 ..... NO REPORT NUMBER
c19 N66-17377 ..... NO REPORT NUMBER
c08 N66-17378 ..... NO REPORT NUMBER
c08 N66-17379 ..... NO REPORT NUMBER
c08 N66-17380 ..... NO REPORT NUMBER
c19 N66-17381 ..... NO REPORT NUMBER
c19 N66-17382 ..... NO REPORT NUMBER
c21 N66-17383 # ISAS-398
c12 N66-17384 # RSIC-451
c30 N66-17385 # ..... NO REPORT NUMBER
c05 N66-17386 # REL-HFG-65-1
c05 N66-17387 ..... NO REPORT NUMBER
c05 N66-17388 ..... NO REPORT NUMBER
c05 N66-17389 ..... NO REPORT NUMBER

Collections of NASA Documents

NASA is depositing its technical documents and bibliographic tools in eleven Federal Regional Technical Report Centers. Each center, located in one of the organizations listed below, is prepared to furnish the general public such services as personal reference, inter-library loans, photocopy service, and assistance in obtaining retention copies of NASA documents.

California: University of California, Berkeley
Colorado: University of Colorado, Boulder
District of Columbia: Library of Congress
Georgia: Georgia Institute of Technology, Atlanta
Illinois: The John Crerar Library, Chicago
Massachusetts: Massachusetts Institute of Technology, Cambridge
Missouri: Linda Hall Library, Kansas City
New York: Columbia University, New York
Pennsylvania: Carnegie Library of Pittsburgh
Texas: Southern Methodist University, Dallas
Washington: University of Washington, Seattle

NASA publications are currently being forwarded to the public libraries in the cities listed below:

Alabama: Birmingham
Alaska: Anchorage
Arizona: Phoenix
Arkansas: Little Rock
California: Los Angeles, Oakland, San Diego, and San Francisco
Colorado: Denver
Connecticut: Hartford and Bridgeport
Delaware: Wilmington
Florida: Miami
Louisiana: New Orleans
Massachusetts: Boston
Michigan: Detroit
Minnesota: St. Paul
Missouri: Kansas City and St. Louis
New Jersey: Trenton
New York: Brooklyn, Buffalo, and Rochester
North Carolina: Charlotte
Ohio: Cleveland, Cincinnati, Dayton, and Toledo
Oklahoma: Oklahoma City
Pennsylvania: Pittsburgh
Tennessee: Memphis
Texas: Fort Worth and San Antonio
Washington: Seattle
Wisconsin: Milwaukee

In addition, NASA regularly sends its publications to the Enoch Pratt Free Library located in Baltimore, Maryland.

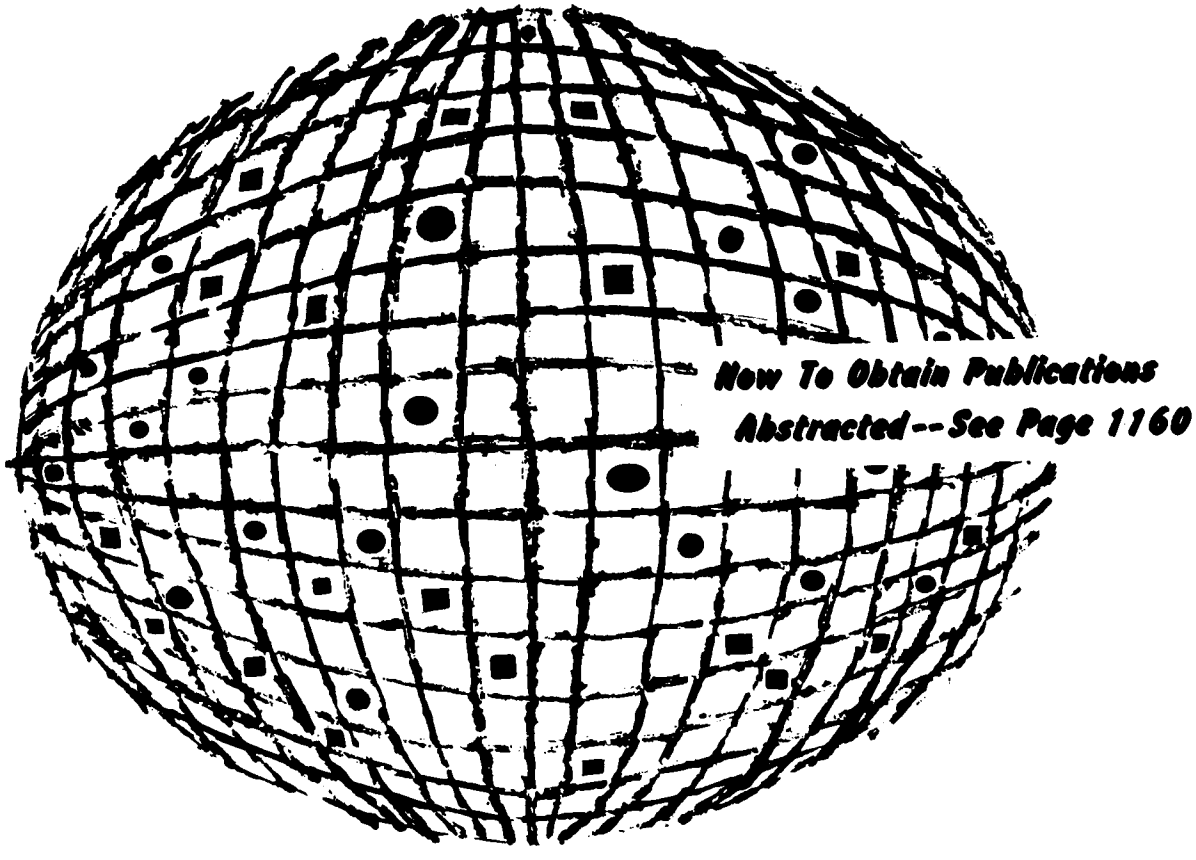
An extensive collection of NASA and NASA-sponsored scientific and technical publications available to the public for reference purposes is maintained at the Technical Information Service, American Institute of Aeronautics and Astronautics, 750 Third Avenue, New York, New York 10017.

ACCESSION NOS. A66-18521 *to* A66-19840

ACCESSION NOS. A66-18521 to A66-19840

INTERNATIONAL AEROSPACE ABSTRACTS

APRIL 15, 1966 VOLUME 6 NUMBER 8



PUBLISHED BY THE TECHNICAL INFORMATION SERVICE
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

INTERNATIONAL AEROSPACE ABSTRACTS VOL. 6 NO. 8 APRIL 15, 1966

international aerospace abstracts

Prepared and published by the
TECHNICAL INFORMATION SERVICE,
AMERICAN INSTITUTE OF
AERONAUTICS AND ASTRONAUTICS, INC.,
under
NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
Contract No. NSR 33-003-009

APRIL 15, 1966 VOL. 6 NO. 8

INTERNATIONAL AEROSPACE ABSTRACTS is published semimonthly by the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc., at Phillipsburg, N. J.

Editorial and Subscription Offices: 750 Third Avenue, New York, N. Y. 10017

Telephone: 212 TN-7-8300 TWX: 212 867-7265

SUBSCRIPTION INFORMATION—
Semimonthly issues: United States and Possessions, 1 year, $25 postpaid; Foreign Countries, 1 year, $33 postpaid.

Cumulated Index Volumes: United States and Possessions, 1 year, $25 postpaid; Foreign Countries, 1 year, $33 postpaid.

Second-class postage paid at Phillipsburg, N. J. Copyright © 1966 by the American Institute of Aeronautics and Astronautics, Inc.

Information regarding SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS and the availability of INTERNATIONAL AEROSPACE ABSTRACTS to organizations having contractual arrangements with NASA may be obtained from the following address:

National Aeronautics and Space Administration
Scientific and Technical Information Division
Attention: Code ATSS-A
Washington, D. C. 20546

INTRODUCTION

INTERNATIONAL AEROSPACE ABSTRACTS (IAA) is an abstracting and indexing service covering the world's published literature in the field of aeronautics and space science and technology. IAA is issued semimonthly, on the 1st and 15th of each month.

Coverage of Published Literature

The following types of publications are covered in IAA:

- Periodicals (including government-sponsored journals) and books.
- Meeting papers and conference proceedings issued by professional societies and academic organizations.
- Translations of journals and journal articles.

Coverage of Reports ("Unpublished" Literature)

Abstracts and indexes of report literature are issued in SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS (STAR), which is published by the Scientific and Technical Information Division, National Aeronautics and Space Administration.

By special arrangement between NASA and the American Institute of Aeronautics and Astronautics, IAA is issued in coordination with the twice-monthly schedule of STAR, which appears on the 8th and 23rd of each month.

IAA and STAR utilize both identical subject categories and indexes, which are described below.

Thus the two services provide comprehensive access to the national and international unclassified report and published literature of current significance to aerospace science and technology.

Arrangement of the Semimonthly Issues

IAA is arranged in two major sections:

(1) Abstracts Section. This section contains complete bibliographic citations with informative abstracts, arranged by appropriate subject categories to facilitate scanning. The subject categories are numbered from 01 to 34, and the scope of each category is outlined in the Table of Contents and again at the beginning of each category in the Abstracts Section. Each abstract is prefixed by the IAA accession number.

(2) Index Section. Four indexes are contained in this section: Subject, Personal Author, Meeting Paper, and Accession Number. Each index is prefaced by explanatory notes to guide the user to the desired abstract.

Cumulated Indexes

Cumulated indexes are prepared and issued promptly at the end of each quarter year, with the fourth quarterly being the annual index.

table of contents

Page

01 Aerodynamics 1161
Includes aerodynamics of bodies, combinations, internal flow (e.g., ducts and turbomachinery); and wings, rotors, and control surfaces.
For applications see: 02 **Aircraft**; and 31 **Space Vehicles.**
For related information see also: 12 **Fluid Mechanics**; and 33 **Thermodynamics and Combustion.**

02 Aircraft 1167
Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc.; and specific types of complete aircraft (e.g., ground-effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control.
For basic research see: 01 **Aerodynamics.**
For related information see also: 31 **Space Vehicles**; and 32 **Structural Mechanics.**

03 Auxiliary Systems 1167
Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic, and electrical systems; actuators; and inverters.
For related information see also: 09 **Electronic Equipment**; 22 **Nuclear Engineering**; and 28 **Propulsion Systems.**

04 Biosciences 1174
Includes aerospace medicine, exobiology, and radiation effects on biological systems; and physiological and psychological factors.
For related information see also: 05 **Biotechnology.**

05 Biotechnology 1176
Includes life-support systems, human engineering, protective clothing and equipment, crew training and evaluation, and piloting.
For related information see also: 04 **Biosciences.**

06 Chemistry 1177
Includes chemical analysis and identification (e.g., spectroscopy).
For applications see: 17 **Materials, Metallic**; 18 **Materials, Nonmetallic**; and 27 **Propellants.**

07 Communications 1179
Includes communications equipment and techniques; noise; radio and communications black-out; modulation telemetry; tracking radar and optical observation; and wave propagation.
For basic research see: 23 **Physics, General**; and 21 **Navigation.**

Page

08 Computers 1187
Includes computer operation and programming; and data processing.
For basic research see: 19 **Mathematics.**

09 Electronic Equipment 1188
Includes electronic test equipment and maintainability; component parts (e.g., electron tubes, tunnel diodes, and transistors); integrated circuitry; and microminiaturization.
For basic research see: 10 **Electronics.**
For related information see also: 07 **Communications**; and 21 **Navigation.**

10 Electronics 1199
Includes circuit theory; and feedback and control theory.
For applications see: 09 **Electronic Equipment.**
For related information see: specific **Physics** categories.

11 Facilities, Research and Support 1202
Includes airports; lunar and planetary bases, including associated vehicles; ground-support systems; related logistics; simulators; test facilities (e.g., rocket-engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

12 Fluid Mechanics 1204
Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence.
For related information see also: 01 **Aerodynamics**; and 33 **Thermodynamics and Combustion.**

13 Geophysics 1212
Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy.
For related information see also: 20 **Meteorology**; 29 **Space Radiation**; and 30 **Space Sciences.**

14 Instrumentation and Photography 1221
Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

15 Machine Elements and Processes 1228
Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

16 Masers 1232
Includes applications of masers and lasers.
For basic research see: 26 **Physics, Solid-State.**

17 Materials, Metallic 1235
Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials.
For basic research see: 06 **Chemistry.**
For related information see also: 18 **Materials, Nonmetallic**; and 32 **Structural Mechanics.**

Appendix G—IAA Sample Pages

Page

8 Materials, Nonmetallic 1243
Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc.
For basic research see: 06 Chemistry.
For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

19 Mathematics 1244
Includes calculation methods and theory; and numerical analysis.
For applications see: 08 Computers.

20 Meteorology 1246
Includes climatology; weather forecasting; and visibility studies.
For related information see also: 13 Geophysics; and 30 Space Sciences.

21 Navigation 1248
Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control.
For related information see also: 07 Communications.

22 Nuclear Engineering 1254
Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power.
For basic research see: 24 Physics, Atomic, Molecular, and Nuclear.
For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

23 Physics, General 1254
Includes acoustics, cryogenics, mechanics, and optics.
For astrophysics see: 30 Space Sciences.
For geophysics and related information see also: 13 Geophysics; 20 Meteorology; and 29 Space Radiation.

24 Physics, Atomic, Molecular, and Nuclear 1257
Includes atomic, molecular, and nuclear physics.
For applications see: 22 Nuclear Engineering.
For related information see also: 29 Space Radiation.

25 Physics, Plasma 1259
Includes magnetohydrodynamics.
For applications see: 28 Propulsion Systems.

26 Physics, Solid-State 1267
Includes semiconductor theory; and superconductivity.
For applications see: 16 Masers.
For related information see also: 10 Electronics.

27 Propellants 1279
Includes fuels; igniters; and oxidizers.
For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion.
For related information see also: 28 Propulsion Systems.

Page

28 Propulsion Systems 1280
Includes air-breathing, electric, liquid, solid, and magnetohydrodynamic propulsion.
For nuclear propulsion see: 22 Nuclear Engineering.
For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion.
For applications see: 31 Space Vehicles.
For related information see also: 27 Propellants.

29 Space Radiation 1282
Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts.
For related information see also: 13 Geophysics; and 24 Physics, Atomic, Molecular, and Nuclear.

30 Space Sciences 1286
Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbits and trajectories.
For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

31 Space Vehicles 1299
Includes launch vehicles; manned space capsules; clustered and multi-stage rockets; satellites; sounding rockets and probes; and operating problems.
For basic research see: 30 Space Sciences.
For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

32 Structural Mechanics 1304
Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests.
For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

33 Thermodynamics and Combustion 1316
Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory.
For related information see also: 12 Fluid Mechanics; and 27 Propellants.

34 General 1321
Includes reports of a broad nature relating to industrial applications and technology, and to basic research; defense aspects; law and related legal matters; and legislative hearings and documents.

Subject Index ..... I- 1
Personal Author Index I-103
Meeting Paper Index I-153
Accession Number Index I-155

how to obtain publications abstracted

All publications abstracted are available from the AIAA Technical Information Service.

Address all inquiries and requests to:

TECHNICAL INFORMATION SERVICE
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, INC.
750 Third Avenue, New York, N. Y. 10017

Telephone: 212 TN-7-8300
TWX: 212 867-7265

LOANS

Individual and Corporate AIAA Members in the United States and Canada, and NASA Centers, may borrow publications without charge. Interlibrary loan privileges are extended to the libraries of government agencies and academic nonprofit institutions in the United States and Canada. The loan period is two weeks, excluding transit time. The borrower pays return postage and insurance.

PHOTOCOPIES

Documents can be supplied in the form of positive paper copies or negative 35-mm. microfilm.

MICROFICHE SUBSCRIPTIONS

Documents available on microfiche are identified in INTERNATIONAL AEROSPACE ABSTRACTS by the symbol # following the accession number in the Abstracts Section and in the Report Number and Accession Number Indexes. Microfiche are made in conformity with Federal Microfiche Standards (COSATI) and are 105 x 148.75 mm. (approximately 4 x 6 inches) in size.

Microfiche of documents announced in INTERNATIONAL AEROSPACE ABSTRACTS may be obtained on annual subscription—each subscription covering all IAA-announced documents that are available on microfiche. Approximately 50 per cent of the documents to be announced in 1966 will be made available in this manner. Subscriptions are accepted on a current basis, and subscribers will be billed monthly for the actual charges at the rate of $0.40 per microfiche issued. Individual microfiche continue to be available on a demand basis at $0.50 each.

RATES

Positive paper copies	$0.25 per page
minimum order	$1.50
Negative 35-mm. microfilm	$0.20 per frame
minimum order	$2.50
Microfiche (demand)	$0.50 per microfiche
Microfiche (subscription)	see above

(Minimum air-mail postage to foreign countries is $1.00)

Requests for loans or photocopies may be made by mail, telephone, telegram, TWX, or in person.

PLEASE REFER TO THE ACCESSION NUMBER WHEN REQUESTING PUBLICATIONS

NOTE: The AIAA does not sell the publications abstracted, except those issued by the AIAA.

INTERNATIONAL

AEROSPACE ABSTRACTS

VOLUME 6 NUMBER 8 APRIL 15, 1966

NOTE: THE SYMBOL # FOLLOWING THE ACCESSION NUMBER INDICATES THAT THE DOCUMENT IS AVAILABLE IN MICROFICHE FORM.

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow (e.g., ducts and turbomachinery); and wings, rotors, and control surfaces.
For applications see: 02 AIRCRAFT; and 31 SPACE VEHICLES.
For related information see also: 12 FLUID MECHANICS; and 33 THERMODYNAMICS AND COMBUSTION.

A66-18530
LAMINAR BOUNDARY LAYER ON A CONE WITH UNIFORM INJECTION.
Paul A. Libby (California, University, La Jolla, Calif.).
Physics of Fluids, vol. 8, Dec. 1965, p. 2216-2218.
Grant No. NGF 05-009-025.

A solution for the laminar boundary layer on a cone with uniform mass transfer is obtained. The velocity field is found for either suction or injection, but the related solution for the energy field is subject to an energy balance at the exposed surface and is therefore valid only for injection. This latter solution is equally applicable to certain species fields as well. The present results along with those presented previously for the two-dimensional case permit a comparison of the effect of injection on boundary layers over two-dimensional and conical surfaces. (Author)

A66-18608 #
APPROXIMATE SOLUTION FOR FLOW OF A COMPRESSIBLE FLUID ABOUT A CIRCULAR CYLINDER.
B. Zajączkowski (Jagellonian University, Dept. of Theoretical Nuclear Physics, Kraków, Poland).
Acta Physica Polonica, vol. 28, Nov. 1965, p. 663-670. 15 refs.

Solution for the problem of flow in a compressible fluid about a circular cylinder at $M < 1$ (where M is the Mach number), by applying the small parameter method. This method enables the flow at a certain contour to be determined (as opposed to other methods where the flow has to be prescribed). The solution yields the contour about which the flow takes place. The method is also applicable, with slight modifications, to both plane and three-dimensional flow about bodies symmetrical with respect to the x-axis. The method is based on an infinite set of equations in derivatives of the second order for the unknown functions $\Phi_i(x, y)$. The zero-order approximation and a first approximation for the problem are given. D. P. F.

A66-18719
VORTEXES FROM THIN VERY ELONGATED WINGS [TOURBILLONS D'AILES MINCES TRES ELANCEES].
Henri Werlé.
La Recherche Aérospatiale, Nov.-Dec. 1965, p. 3-12. 9 refs. In French.

Results of an experimental investigation on the vortex characteristics of thin very elongated wings in low-velocity flow. The behavior of these wings was made visible by the use of colored dyes and air bubbles; photographs illustrate the vortex characteristics for various types of wing configuration. The influence of wing angle of attack, yaw, Reynolds number, and flow velocity are determined experimentally. The behavior of thin elongated wings in low-velocity flow is compared with that of symmetrical bodies of revolution. The effect of varying degrees of wing elongation is investigated. D. P. F.

A66-18747
FREE MOLECULAR HEAT TRANSFER IN THE IONOSPHERE.
Leon M. Gilbert and Sinclaire M. Scala (General Electric Co., Missile and Space Div., Space Sciences Laboratory, Valley Forge, Pa.).
IN: INTERACTIONS OF SPACE VEHICLES WITH AN IONIZED ATMOSPHERE.
Edited by S. F. Singer.
New York, Pergamon Press, Inc., 1965, p. 283-303. 38 refs.

Modification of the usual heat transfer and mass flux expressions to allow for a multicomponent chemically reacting mixture of gases in order to evaluate the importance of the energy released in the recombination processes taking place at the surface of a vehicle. These expressions include the effects which result from the recombination interactions at the solid-gas interface caused by the transport of atomic and ionized particles to the vehicle. Results of the numerical solutions are presented graphically as functions of the altitude and flight velocity, and the magnitudes of the various modes of energy transferred to the vehicle are compared. It is shown that for many free molecular situations of interest, the kinetic terms in the transfer equations are the dominant ones. B. B.

A66-18810 #
EFFECT OF BOUNDARY-LAYER TRANSITION ON DYNAMIC STABILITY.
Peter Jaffe and Robert H. Prislin (California Institute of Technology, Jet Propulsion Laboratory, Aerodynamic Facilities Section, Pasadena, Calif.).
(American Institute of Aeronautics and Astronautics, Annual Meeting, 1st, Washington, D.C., June 29-July 2, 1964, Paper 64-427.)
Journal of Spacecraft and Rockets, vol. 3, Jan. 1966, p. 46-52. 15 refs.
[For abstract see issue 16, page 1170, Accession no. A64-20130]

A66-18811 #
RE-EVALUATION OF HEAT-TRANSFER DATA OBTAINED IN FLIGHT TESTS OF HEAT-SINK SHIELDED RE-ENTRY VEHICLES.
J. D. Murphy and M. W. Rubesin (Itek Corp., Vidya Div., Palo Alto, Calif.).
(AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, ENTRY TECHNOLOGY CONFERENCE, WILLIAMSBURG AND HAMPTON, VA., OCTOBER 12-14, 1964, TECHNICAL PAPERS. AIAA Publication CP-9, p. 77-92.)
Journal of Spacecraft and Rockets, vol. 3, Jan. 1966, p. 53-60. 31 refs.
Contract No. NAS 7-216.
[For abstract see issue 23, page 2042, Accession no. A64-26659]

A66-18824 #
INVESTIGATION INTO THE PERFORMANCE CHARACTERISTICS OF A FRICTION TURBINE.
E. William Beans (North American Aviation, Inc., Columbus Div., Power Systems Group, Columbus, Ohio).
Journal of Spacecraft and Rockets, vol. 3, Jan. 1966, p. 131-134. 13 refs.

A friction or Tesla turbine was theoretically investigated by using the differential form of the equation of motion. A partial closed-form solution was obtained for the case of incompressible laminar flow, and a method of solution is indicated for other types of flow. The performance of a 6-in. air turbine was calculated, and it was tested over ranges of angular velocity (4000-18,000 rpm), supply pressure (10-40 psig), and disk spacing (0.026-0.5 in.). Turbine efficiencies ranged from 7 to 25%. The qualitative agreement between calculated and experimental performance was satisfactory (correct trends), but the quantitative agreement was less than satisfactory. (Author)

SUBJECT INDEX

LIST OF SUBJECT HEADINGS OF PUBLICATIONS

A Notation of Content, rather than the title of the publication, appears under each subject heading; it is listed under several subject headings which provide multiple access to the subject content of each accession. The IAA accession number is located under and to the right of the Notation of Content and is preceded by the category number. The category number identifies the subject category as listed in the Table of Contents of each issue of *International Aerospace Abstracts.*

To illustrate:

Category Number	Accession Number
c01	A66-12345

A

ABERRATION
Electro-optical attitude and velocity sensors for interplanetary navigation and stellar aberration and Doppler shift measurements c21 A66-19502

ABLATING MATERIAL
Effectiveness of charring ablators strongly influenced by stream enthalpy level and heating rate c33 A66-18812
Ablation rates, surface temperature, emittances and reradiated fluxes of heat shield materials heated by irradiation
AIAA PAPER 66-44 c33 A66-19070
Photographic spectra of ablating plastics in thermodynamic environments related to species and temperatures in boundary layers
AIAA PAPER 66-132 c33 A66-19071
Low temperature chemical vapor-plating process for obtaining pyrolitic titanium diborade filaments for ablative composites c18 A66-19140

ABLATION
Asymmetrical ablation cause of persistent roll resonance in nominally symmetrical reentry vehicles
AIAA PAPER 66-49 c31 A66-18950

ABSORPTION BAND
Carbon dioxide absorption bands in Mars atmosphere, transmission, function of carbon dioxide amount and effective surface pressure
AIAA PAPER 66-147 c30 A66-19072

ABSORPTION COEFFICIENT
Resonance Raman effect in crystals, discussing spontaneous and simulated scattering efficiency c24 A66-19233

ABSORPTION SPECTRUM
Validity of Kirchhoff law for apparent local spectral emittance and absorptance and total flux calculations for spacecraft cavities
AIAA PAPER 65-135 c33 A66-18793
Oscillations in impurity photoconductivity and absorption spectra of p-germanium samples c26 A66-18973

ACCELERATION STRESS
Experiments with anesthesized dogs subjected to g accelerations, observing behavior of arterial oxygen saturation and pulmonary ventilation during short periods c04 A66-19083

ACCELEROMETER
Gyroscopes, accelerometers and error sources in inertial navigation systems c21 A66-19056
Vehicle angular velocity determined, using configurations with only linear accelerometers and no gyroscopes for inertial navigation systems c14 A66-19488

ACOUSTIC VIBRATION
Temperature-velocity phase lag of vibrations of air columns excited by heat supply c33 A66-19555

ADAPTIVE CONTROL SYSTEM
Model reference adaptive control systems for calculating system variables of sinusoidal or ramp function input signals c10 A66-18672

ADIABATIC EQUATION
Transient behavior of heated stellar atmosphere, examining unsteady flow caused by sudden application of heat to static adiabatic atmosphere c30 A66-18541
Adiabatic laminar flow in concentric sleeve seal where rotating shaft changes fluid temperature and viscosity
ASLE PREPRINT 65AM 4C3 c15 A66-19382
Nonisentropic simple waves in two-dimensional steady flow of ideal gas c12 A66-19585

AEROBEE ROCKET
Plasma sheath effects on antenna impedance probe and retarding potential probe installed on two Aerobee 150 rockets c07 A66-18746

AERODYNAMIC CHARACTERISTICS
Aerodynamic characteristics of wakes behind hypervelocity bodies
AIAA PAPER 66-53 c01 A66-18952
Peculiarities of aerodynamic characteristics of flow past plate and pointed and blunt slender cones in viscous hypersonic thermodynamically ideal gas c01 A66-19571

AERODYNAMIC HEAT TRANSFER
Aerodynamic properties of simple bodies in hypersonic transition regime c01 A66-19132

AERODYNAMIC LOAD
Aerodynamic pressure and resistance calculated from gas flow past circular cylinders with piecewise constant diameters c15 A66-19338

AERODYNAMIC STABILITY
Free flight dynamic stability measurements indicate that boundary layer transition has no perceptible effect
AIAA PAPER 64-427 c01 A66-18810

AEROMAGNETISM
Comparison of magnetic observations aboard Zaria and aeromagnetic surveying according to magnet plan c13 A66-19040

AEROSOL
Cascade vault sampler for bacterial aerosols c05 A66-19087
Critical condition for aerosol deposition from symmetrical flow past solid body, considering case of circular cylinder c20 A66-19304
Measurement of radioactivity in air of free atmosphere and interior of cloudy areas and absorption of radioactive aerosols by water droplets c29 A66-19305
Separation problems of gas and aerosol components in brightness of atmospheric layer for photometric data pertaining to Mars atmosphere c30 A66-19330
Difference between values for atmospheric pressure at Martian surface when obtained by photometry or by spectroscopy, due to nonconsideration of light scattering by aerosol particles c30 A66-19331

AEROSPACE MEDICINE
Morphological characteristics and functional data in pilot trainees, noting anthropometric data and

PERSONAL AUTHOR INDEX

LISTING OF PERSONAL AUTHORS OF PUBLICATIONS

The title of the publication—*not* the Notation of Content—appears under each author listing. In the case of a foreign-language title, the English translation appears first. The accession number is located under and to the right of the title and is preceded by the category number. The category number identifies the subject category as listed in the Table of Contents of each issue of *International Aerospace Abstracts*.

To illustrate:

Category Number	Accession Number
c01	A66-12345

To compensate for computer printing limitations, substitutes have been used for certain punctuation marks, as follows: / for parentheses, * for the apostrophe and single quotation marks, and ** for double quotation marks. For the same reason, mathematical signs and symbols have been expressed in words.

A

ABE, T.
X-ray investigation on fatigue damage of metals under mean stress. I - Plane bending fatigue. c32 A66-19551

ABEN, KH. K.
Optical effects in photoelastic coatings in shell studies /Ob opticheskikh iavleniiakh v fotouprugikh pokrytiakh pri issledovanii obolochek/. c32 A66-18883

ACHKASOV, IU. S.
Separation of signals from noise when the loss functions depend on the duration of signal observation /Vydelenie signalov iz shumov pri funktsiiakh poter*, zavisiashchikh ot vremeni nabliudeniia za signalami/. c07 A66-19673

ADAM, N. V.
Computation of the geomagnetic field at great heights. c13 A66-19039

ADAMOV, I. IU.
Instability in an oscillating-electron discharge. I - Microwave radiation. c25 A66-19180

Instability in an oscillating-electron discharge. II - Anomalous diffusion of the plasma. c25 A66-19181

ADAMS, E.
Approximations with an estimate of error for stationary boundary layers with the desired distribution of pressure and mass transfer along the wall /Naeherungsloesungen mit Fehlerabschaetzung fuer stationaere Grenzschichten mit beliebigen Verteilungen von Druck und Massenuebergang an der Wand/. c01 A66-19828

ADAMS, W. R.
The inhalational toxicity of oxygen difluoride. c04 A66-19723

ADIROVICH, E. I.
Semiconductor films with a narrow forbidden zone, producing photovoltages of 5000 v /Poluprovodnikovye plenki s uzkoi zapreshchennoi zonoi, razvivaiushchie fotonapriazheniia v 5000 v/. c26 A66-19621

AFANASEV, M. I.
The quantitative interpretation of gas chromatograms. c06 A66-19383

AFANASEVA, V. I.
Variations from day to day in the rate of diurnal rotation of the earth and possible reasons for these variations - Preliminary report /Izmeneniia oto dnia ko dniu skorosti sutochnogo vrashcheniia zemli i vozmozhnye prichiny etikh izmenenii - Predvaritel*noe soobshchenie/. c13 A66-19787

AGAEV, A. M.
Determination of deep Fe, Ni, and Co levels in gallium arsenide /Opredelenie glubokikh urovnei Fe, Ni i Co v arsenide galliia/. c26 A66-19624

AGAMIRZIAN, L. S.
Boundary-value problems of the plane theory of ideally plastic bodies /Granichnye zadachi ploskoi teorii ideal* no plasticheskikh tel/. c32 A66-18703

AGARWAL, S. P.
Survey of cosmic-ray intensity in the lower atmosphere. c29 A66-19398

AITKHOZHIN, S. A.
Structure and electrical properties of thin films of p-type GaSb. c26 A66-18588

AKAGI, J. M.
The participation of a ferredoxin of clostridium nigrificans in sulfite reduction. c06 A66-18699

AKASOFU, S.-I.
The polar electrojet. c13 A66-19216

Growth and decay of the ring current and the polar electrojets. c13 A66-19406

AKHMANOV, S. A.
Influence of the finite aperture of a light beam on nonlinear effects in an anisotropic medium. c16 A66-18969

AKHMETZIANOV, M. KH.
Use of photoelastic coatings in shell studies /O primenenii fotouprugikh pokrytii dlia issledovaniia obolochek/. c32 A66-18882

AKIMOV, A. V.
Measurement of plasma conductivity by a radio-frequency method. c25 A66-19190

AKIMOV, I. A.
Experimental check on the hypothesis of the p-n mechanism of spectral sensitivity /Eksperimental*naia proverka gipotezy o p-n-mekhanizme spektral*noi sensibilizatsii/. c06 A66-19640

AKIYAMA, M.
Spherical bubble collapse in uniformly subcooled liquids. c33 A66-19559

AKULOV, L. A.
Analytical dependence of liquid oxygen density on temperature and pressure /Analiticheskaia zavisimost* plotnosti zhidkogo kisloroda ot temperatury i davleniia/. c27 A66-19428

ALADINSKII, V. K.
Effect of phonons on the temperature dependence of tunnel breakdown in silicon /O vliianii fononov na temperaturnuiu zavisimost* tunnel*nogo proboia v kremnii/. c26 A66-19615

ALANAKIAN, G. A.
Use of the root hodograph method in the investigation of the frequency characteristics of dynamic linear systems /Ob odnom primenenii metoda kornevogo godografa pri issledovanii chastotnykh kharakteristik lineinykh dinamicheskikh sistem/. c10 A66-19692

ALBRIGHT, G. G.
Fuses that won*t blow. c09 A66-19504

ALEKSANDROV, A. IA.
Application of the analytical functions of a complex variable to the solution of three-dimensional nonaxisymmetrical problems of a body of revolution in the theory of elasticity /Primenenie analiticheskikh funktsii

MEETING PAPER INDEX

LISTING OF MEETING PAPERS

To the right of each meeting paper number is the subject category number, as listed in the Table of Contents of each issue of *International Aerospace Abstracts*, followed by the IAA accession number. When a number sign (#) is present, it indicates that the document is available on microfiche.

To illustrate:

Meeting Paper Number	Category Number	Accession Number	Microfiche Available
AIAA PAPER 65-507	c30	A66-10192	#

AIAA PAPER 64-333	c31	A66-18817 #
AIAA PAPER 64-423	c11	A66-18814 #
AIAA PAPER 64-426	c27	A66-18809 #
AIAA PAPER 64-427	c01	A66-18810 #
AIAA PAPER 64-455	c03	A66-18813 #
AIAA PAPER 65-7	c33	A66-19153 #
AIAA PAPER 65-10	c28	A66-19137 #
AIAA PAPER 65-104	c28	A66-19163 #
AIAA PAPER 65-135	c33	A66-18793 #
AIAA PAPER 66-1	c01	A66-18983 #
AIAA PAPER 66-10	c30	A66-18984 #
AIAA PAPER 66-14	c02	A66-18985 #
AIAA PAPER 66-17	c01	A66-18951 #
AIAA PAPER 66-30	c12	A66-18986 #
AIAA PAPER 66-32	c30	A66-18948 #
AIAA PAPER 66-33	c01	A66-18954 #
AIAA PAPER 66-34	c01	A66-18957 #
AIAA PAPER 66-35	c30	A66-18987 #
AIAA PAPER 66-37	c30	A66-18988 #
AIAA PAPER 66-40	c30	A66-19727 #
AIAA PAPER 66-44	c33	A66-19070 #
AIAA PAPER 66-49	c31	A66-18950 #
AIAA PAPER 66-52	c21	A66-18989 #
AIAA PAPER 66-53	c01	A66-18952 #
AIAA PAPER 66-57	c01	A66-18990 #
AIAA PAPER 66-58	c31	A66-18991 #
AIAA PAPER 66-64	c27	A66-19728 #
AIAA PAPER 66-66	c27	A66-18992 #
AIAA PAPER 66-67	c33	A66-18993 #
AIAA PAPER 66-68	c33	A66-18949 #
AIAA PAPER 66-73	c25	A66-18956 #
AIAA PAPER 66-74	c14	A66-19726 #
AIAA PAPER 66-76	c25	A66-18994 #
AIAA PAPER 66-78	c01	A66-18995 #
AIAA PAPER 66-82	c32	A66-18996 #
AIAA PAPER 66-85	c33	A66-18997 #
AIAA PAPER 66-92	c31	A66-18998 #
AIAA PAPER 66-93	c30	A66-18999 #
AIAA PAPER 66-97	c12	A66-19000 #
AIAA PAPER 66-107	c12	A66-18955 #
AIAA PAPER 66-117	c28	A66-19001 #
AIAA PAPER 66-123	c32	A66-19002 #
AIAA PAPER 66-130	c01	A66-18953 #
AIAA PAPER 66-131	c21	A66-19565 #
AIAA PAPER 66-132	c33	A66-19071 #
AIAA PAPER 66-139	c32	A66-19003 #
AIAA PAPER 66-141	c32	A66-19004 #
AIAA PAPER 66-143	c32	A66-19005 #
AIAA PAPER 66-147	c30	A66-19072 #
AIAA PAPER 63059-63	c31	A66-18807 #
ASLE PREPRINT 65AM 4C3	c15	A66-19382

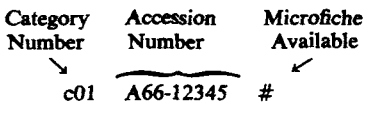
MTG. PAPER

ACCESSION NUMBER INDEX

LIST OF ACCESSION NUMBERS

The list of IAA accession numbers may be used to locate the subject category in which a specific item can be found. Accession numbers are arranged in ascending order, and each is preceded by a number which identifies the subject category as listed in the Table of Contents of each issue of *International Aerospace Abstracts*. When a number sign (#) is present, it indicates that the document is available on microfiche.

To illustrate:



c12 A66-18521
c12 A66-18522
c12 A66-18523
c12 A66-18524
c25 A66-18525
c25 A66-18526
c12 A66-18527
c12 A66-18528
c12 A66-18529
c01 A66-18530
c12 A66-18531
c33 A66-18532
c12 A66-18533
c12 A66-18534
c25 A66-18535
c25 A66-18536
c25 A66-18537
c25 A66-18538
c25 A66-18539
c12 A66-18540
c30 A66-18541
c12 A66-18542
c25 A66-18543
c25 A66-18544
c25 A66-18545
c25 A66-18546
c31 A66-18547
c34 A66-18548
c34 A66-18549
c34 A66-18550
c34 A66-18551

c34 A66-18552
c31 A66-18553
c31 A66-18554
c31 A66-18555
c31 A66-18556
c02 A66-18557
c34 A66-18558
c34 A66-18559
c34 A66-18560
c30 A66-18561
c31 A66-18562
c31 A66-18563
c31 A66-18564
c31 A66-18565
c31 A66-18566
c31 A66-18567
c07 A66-18568
c07 A66-18569
c30 A66-18570
c31 A66-18571
c28 A66-18572
c28 A66-18573
c22 A66-18574
c28 A66-18575
c28 A66-18576
c11 A66-18577
c05 A66-18578
c05 A66-18579
c31 A66-18580
c05 A66-18581
c04 A66-18582

c04 A66-18583
c05 A66-18584
c04 A66-18585
c21 A66-18586
c07 A66-18587
c26 A66-18588
c17 A66-18589
c02 A66-18590
c32 A66-18591 #
c32 A66-18592 #
c32 A66-18593 #
c32 A66-18594 #
c32 A66-18595 #
c32 A66-18596 #
c32 A66-18597 #
c32 A66-18598 #
c32 A66-18599 #
c32 A66-18600 #
c12 A66-18601 #
c32 A66-18602 #
c32 A66-18603 #
c32 A66-18604 #
c32 A66-18605 #
c29 A66-18606 #
c26 A66-18607 #
c01 A66-18608 #
c16 A66-18609 #
c13 A66-18610 #
c07 A66-18611 #
c07 A66-18612 #
c03 A66-18613

c28 A66-18614 #
c26 A66-18615 #
c09 A66-18616 #
c06 A66-18617 #
c32 A66-18618 #
c29 A66-18619 #
c13 A66-18620 #
c23 A66-18621 #
c17 A66-18622
c17 A66-18623
c15 A66-18624
c09 A66-18625 #
c29 A66-18626 #
c02 A66-18627
c12 A66-18628
c28 A66-18629
c15 A66-18630
c23 A66-18631
c16 A66-18632
c26 A66-18633
c32 A66-18634
c30 A66-18635
c17 A66-18636
c19 A66-18637
c13 A66-18638
c23 A66-18639
c30 A66-18640
c09 A66-18641
c09 A66-18642
c25 A66-18643
c25 A66-18644
c24 A66-18645
c16 A66-18646
c26 A66-18647
c16 A66-18648
c26 A66-18649

c16 A66-18650
c17 A66-18651
c09 A66-18652
c09 A66-18653
c26 A66-18654
c26 A66-18655
c09 A66-18656
c26 A66-18657
c09 A66-18658
c26 A66-18659
c09 A66-18660
c26 A66-18661
c09 A66-18662
c26 A66-18663
c09 A66-18664
c09 A66-18665
c09 A66-18666
c09 A66-18667
c09 A66-18668
c09 A66-18669
c10 A66-18670
c10 A66-18671
c10 A66-18672
c13 A66-18673
c12 A66-18674
c25 A66-18675
c26 A66-18676
c12 A66-18677
c26 A66-18678
c14 A66-18679
c07 A66-18680
c09 A66-18681
c09 A66-18682
c14 A66-18683
c33 A66-18684
c15 A66-18685

GLOSSARY
of
Selected Terms, Abbreviations, and Acronyms

AC	Aircraft Circular
Acceptance Ratio	The ratio of accepted citations to the total citations retrieved as "hits" in a machine search.
ACR	Advance Confidential Report
AD	Accession Number prefix utilized by DDC; "Accessioned Document" or "ASTIA Document."
AEC	Atomic Energy Commission
AGARD	Advisory Group for Aerospace Research and Development (NATO)
AIAA	American Institute of Aeronautics and Astronautics
AM	Aerospace Medicine and Biology
Analytic	A document the contents of which are analyzed by treating individual sections as if they were documents in their own right and accessioning, cataloging, abstracting, and indexing the sections. The main document is sometimes referred to as the "Analytic Primary" or "Mother;" the sections as the "Analytic Subsidiaries" or "Daughters."
APC	Automatic Postings Control System
ARC	Ames Research Center
ARR	Advance Restricted Report
Automatic Postings Control System (APC)	A system involving inverted files as auxiliaries to the basic Linear File and serving as validation authorities for updates, deletes, and transfers to it; also as a source of posting usage and frequency data.
CB	Confidential Bulletin
CCN	Classification Change Notices
CFSTI	Clearinghouse for Federal Scientific and Technical Information

Glossary

Coded Terms	Randomized five-character codes assigned programmatically to alphabetic subject index terms.
Contents Note	A listing of the sections or chapters of a document, usually presented in lieu of an abstract.
Continuing Bibliography	A bibliography issued irregularly in periodic supplements, as the references accumulate to sufficient levels; on subjects of established interest to the space program.
COSATI	Committee on Scientific and Technical Information
CR	Contractor Report
CSCL	COSATI Subject Category List
CSTAR	Classified Scientific and Technical Aerospace Reports
DDC	Defense Documentation Center
Demand Bibliography	Same as Literature Search
Dewey Number	See "N-Number"
DOD	Department of Defense
Double Number	See "N-Number"
EP	Educational Publication
ERC	Electronics Research Center
Facility	NASA Scientific and Technical Information Facility (1965 -) Scientific and Technical Information Facility (1962 - 1964)
Flash Sheet	A form for the very early announcement of an innovation emerging from research at one of the NASA-supported research installations. Flash sheets of sufficient merit become Tech Briefs, q.v.
FRC	Flight Research Center
GAP	NASA-SP-9, Index of NASA Technical Publications, July 1960 - December 1961. Covers the "gap" between the older indexes and TPA, Vol. 2
GPO	Government Printing Office
GRACE	Graphic Arts Composing Equipment
GSFC	Goddard Space Flight Center

Hard Copy (HC)	A reproduced copy of a document, whether at full-size or moderate reduction; a photocopy.
HC	Hard Copy; same as PH = Photocopy.
Hit	A citation which satisfies the conditions of a search and which prints out in response to it.
IAA	International Aerospace Abstracts
JPL	Jet Propulsion Laboratory
LeRC	Lewis Research Center
Literature Search	A search of the Facility's collection of bibliographic data for references on a specific subject, in response to an outside request from a valid requester.
LRC	Langley Research Center
MAA	Master Address Authority File
Machine Term	A subject index term that does not appear in the published indexes to the abstract journals, but which is on the magnetic tape file and accessible for machine searching.
MF	Microfiche
MI	Microfilm
MR	Memorandum Report
MSC	Manned Spacecraft Center
MSFC	Marshall Space Flight Center
NACA	National Advisory Committee for Aeronautics (1915 - October 1958)
NAS	NASA Contract Number prefix
NASA	National Aeronautics and Space Administration (October 1958 -)
NASA Formal Report	Any of several report series published by NASA; reports go through the routine NASA publications screening and appear under NASA's name and emblem; e.g., NASA-TN-D, TM-X, TR-R, SP, CR, TT-F. Not generally included in this group are NASA Center informal reports or NASA Contractor reports to which are assigned NASA-TM-X-50000 or NASA-CR-50000 numbers for control purposes only.

Glossary

NASr	NASA Contract Number prefix
NASw	NASA Contract Number prefix
NLM	National Library of Medicine
NOC	Notation of Content
Notation of Content (NOC)	An improved title, a condensed statement eliminating common words and headlining all substantive terms used as major indexing points; used in certain of the abstract journal indexes.
NSA	Nuclear Science Abstracts
NsG	NASA Contract Number prefix
N-Number	An accession number series preceded by "N" used by Langley Research Center in the processing of documents since 1951, e.g., N-9678.
OTS	Office of Technical Services (now CFSTI)
OTU	Office of Technology Utilization
P	Published Term
PH	Photocopy, see also Hard Copy
Photon	A photocomposition device made by Photon, Inc. The Photon 200 operates from paper tape; the Photon 713 operates directly from magnetic tape.
Published Term	An index term that appears in the published indexes to the abstract journals.
RATR	Reliability Abstracts and Technical Reviews
RB	Restricted Bulletin
RD	Restricted Data
Relative Master	The Facility tape containing the cross-reference structure for the subject index terms.
RM	Research Memorandum
Root	The leading characters of a term, generally providing a more generic designation, as NAS8 being a root of NAS8-12345, the specific contract.

RP	Reprint, as in NASA-RP Series
RQT	A Facility request for a document made because the Facility has received a request for the same document.
SDI	Selective Dissemination of Information
Service Report	A NASA document prepared at the request of another Government agency and requiring the permission of that agency before it can be released to a requester.
SP	Special Publication
Special Release	A NASA document requiring the permission of a specific NASA office before it can be released to a requester; some contain proprietary information.
SQT	A Facility request for a document made because it appears to be aerospace related.
SSTAR	Secret Supplement to Classified STAR
STAR	Scientific and Technical Aerospace Reports
STID	Scientific and Technical Information Division (NASA)
SVDC	Space Vehicle Design Criteria (NASA-SP 8000 Series)
TAB	Technical Abstract Bulletin (DDC)
TB	Tech Brief
Tech Brief	A single sheet publication disseminating to U. S. industry information concerning a technical innovation that has emerged in the course of NASA sponsored research; developed from selected Flash Sheets, q.v.
TIB	Technical Information Bulletin
TM	Technical Memorandum
TN	Technical Note
TPA	Technical Publications Announcements
TR	Technical Report
TT	Technical Translation
TUD	Technology Utilization Division (NASA)

Glossary

WOO	Western Operations Office (NASA)
WR	Wartime Report
*	STAR index designation for a NASA supported document
#	STAR index designation for a document that has been put on microfiche.

ADDENDUM: REGIONAL DISSEMINATION CENTERS FOR TECHNOLOGY UTILIZATION

ARAC	Aerospace Research Applications Center (University of Indiana)
CAST	Center for Application of Sciences and Technology (Wayne State University)
KAS	Knowledge Availability Systems Center (University of Pittsburgh)
MRI	Midwest Research Institute, Kansas City, Missouri
NCSTRC	North Carolina Science and Technology Research Center, Durham
TAC	Technology Applications Center (University of New Mexico)
TUSC	Technology Use Studies Center (Southeastern State College, Oklahoma)

REFERENCES

1. Redman, H. F. and L. E. Godfrey, Eds., Dictionary of Report Series Codes, New York, Special Libraries Assoc., 1962. 648 p.

2. Scientific and Technical Information Facility, Reference Department, Guide to Machine Searching and Retrieval of Information. November 1963. 43 p. (Inverted File System for IBM-1401.)

3. Swid, R., "Linear vs. Inverted File Searching on Serial Access Machines," In Proceedings of the American Documentation Institute, Annual Meeting, 1963. Automation and Scientific Communication. Short Papers. Part I, p. 169-170.

4. Price, W. H., "A Computer Oriented Photo-Composition System for STAR," In Proceedings of the American Documentation Institute, Annual Meeting, 1963. Automation and Scientific Communication. Short Papers. Part I, p. 261-262.

5. Rothgeb, C. L., "Centralized Processing of Technical Information at the Scientific and Technical Information Facility," In Proceedings of the American Documentation Institute, Annual Meeting, 1963. Automation and Scientific Communication. Short Papers. Part I, p. 277-278.

6. Brandhorst, W. T., Machine Searching at NASA's Scientific and Technical Information Facility, Presented at American Documentation Institute, New York Chapter, May 1964. 13 p. (Meeting theme: Machine Searching: Myth or Reality?)

7. Slamecka, V., "Machine Compilation and Editing of Printed Alphabetical Subject Indexes," American Documentation, v. 15, no. 2, April 1964. p. 132-135.

8. Scientific and Technical Information Facility, Publications and Data Control Department, Instructions for Document Processing Sheet (DPS), Form 600. June 9, 1964, various pagings. Processed.

9. Miller, L., S. Rosen, and R. Swid, "Data Processing Techniques in an Information System," In Proceedings of the American Documentation Institute, Annual Meeting, 1964. Parameters of Information Science, v. 1, p. 319-322.

10. Swid, R., "A Pragmatic Approach to Retrospective Searching," In Proceedings of the American Documentation Institute, Annual Meeting, 1964. Parameters of Information Science, v. 1, p. 319-322.

11. Brandhorst, W. T. and P. F. Eckert, Guide to Machine Searching and Retrieval of Information for the NASA Linear File. Dec. 1964. 70 p. (IBM-1410 System)

12. Republic Aviation Corporation, A "Universal" Information Retrieval System Developed by Republic Aviation Corporation (J. Barnes and J. Rini). December 1964. 12 p. (IBM-7090/94 System)

13. Federal Council for Science and Technology, COSATI Subject Category List, First Edition, Washington, D. C., Office of Science and Technology, December 1964. 55 p. AD-612200.

References

14. National Aeronautics and Space Administration. Scientific and Technical Information Division, NASA Publications Manual, Washington, D. C., GPO, 1964. 74 p. NASA-SP-7013.

15. National Science Foundation, National Aeronautics and Space Administration, Washington, D. C., GPO, March 1965. NSF-64-29 (In its series: "Scientific Information Activities of Federal Agencies").

16. Brandhorst, W. T. and P. F. Eckert, "NASA Search System Analysis Sheet," American Documentation, v. 16, no. 2, April 1965. p. 124-126.

17. Ebersole, J. L. and J. M. Worth, Description of the North American Aviation Technical Information Processing System, April 24, 1965. 48 p.

18. Brandhorst, W. T. and P. F. Eckert, Guide to Machine Searching and Retrieval of Information for the NASA Linear File—IBM-1401 System Supplement, July 1, 1965. 60 p.

19. Eckert, P. F., Development and Operation of Machine Search Systems at NASA's Scientific and Technical Information Facility, Presented at American Chemical Society, Div. of Chemical Literature, 150th Meeting, Atlantic City, New Jersey, September 12-17, 1965.

20. Canter, J. D. and C. E. Donaghey (Knowledge Availability Systems Center) UPLIFTS - University of Pittsburgh Linear File Tandem System, Communications of the ACM, v. 8, no. 9, September 1965. p. 579-581. NASr-234. (IBM-7090 System.)

21. Hubbell, James R. (Indiana University), ARAC Computerized Information Systems, December 2, 1965. 12 p.

22. Canter, John (Knowledge Availability Systems Center), STERILE - System of Terminology for Retrieval of Information Through Language Engineering, 1965. 6 p.

23. Brandhorst, W. T., Simulation of Boolean Logic Constraints Through the Use of Term Weights, December 1965. 5 p. Submitted for publication.